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VIEWS, NEWS AND INTERVIEWS.

When the Edison Electric Illuminating Company, of Brooklyn, N. Y., recently executed a mortgage for $10,000,000 to secure a like amount of bonds which the stockholders had agreed to issue, they supposed that, inasmuch as only $2,000,000 of the bonds are to be issued at present, the internal revenue tax would only apply to the $2,000,000. As soon as the mortgage was executed the company submitted the documents to Internal Revenue Collector Moore and asked for an early decision as to how much they would have to pay under the War Revenue act. Mr. Moore forwarded the papers to Washington, and received a reply from Commissioner Scott to the effect that the entire amount of $10,000,000 is subject to the war revenue tax, and that the tax will be $5,000.

An electric cab service, similar to the one in New York city, is to be established in Chicago about the first of the year.

The telephone girls are to wear a special uniform. Can you imagine a special uniform on Owego's telephone girls just as they are now constituted?—*Owego, N. Y., Record.*

Anent the foregoing, it may make the matter of interest to explain that the "girls" in the Owego exchange are young men.—*Elmira, N. Y., Gazette.*

It is reported from London that an agreement has been arranged with the Congo Free State, allowing the survey of an African transcontinental telegraph line along the western shores of lakes Tanganyika and Albert Edward.

An electrical omnibus has lately been put in service experimentally in Berlin. It has accommodations for 26 passengers, measures 23 feet in length by 6½ feet in width, while its weight, including the battery, is 6.65 metrical tons. The battery, which consists of 120 cells, contained in 24 boxes, weighs about one and three-fourths tons, and is stated to have a capacity sufficient to run the vehicle a distance of 60 kilometers (37½ miles) at a speed ranging from 6 to 12 kilometers per hour. The motor is geared to the front axle of the omnibus.

The second electric railway undertaking in Japan is the Hoshu Electric Railway, which will run from Beppu to Oita, in Kyushu. Work was suspended for a while, owing to financial difficulties, but these have now been overcome and the construction is steadily advancing. The contract for all the materials was let to the Saiga Electric Company, of Kyoto, according to a New York daily paper. The company has made the following purchases: Two Lancashire-type boilers of 160 horse-power each (made in Japan); one 160-horse-power McIntosh & Seymour high-speed engine; one six-pole, 160-kilowatt General Electric railway generator; 10 No. 21 Brill trucks, and twenty 25-horse-power railway motors. A good part of this material has already been forwarded, and considerable is yet to go. The engineers in charge of the work are H. Maki and T. Saigi, both officers in the company.

The National Electrical Trades Association, of Chicago, has been incorporated by Charles E. Pain, James E. Courson and F. P. Voce, without capital, for the mutual protection of its members.

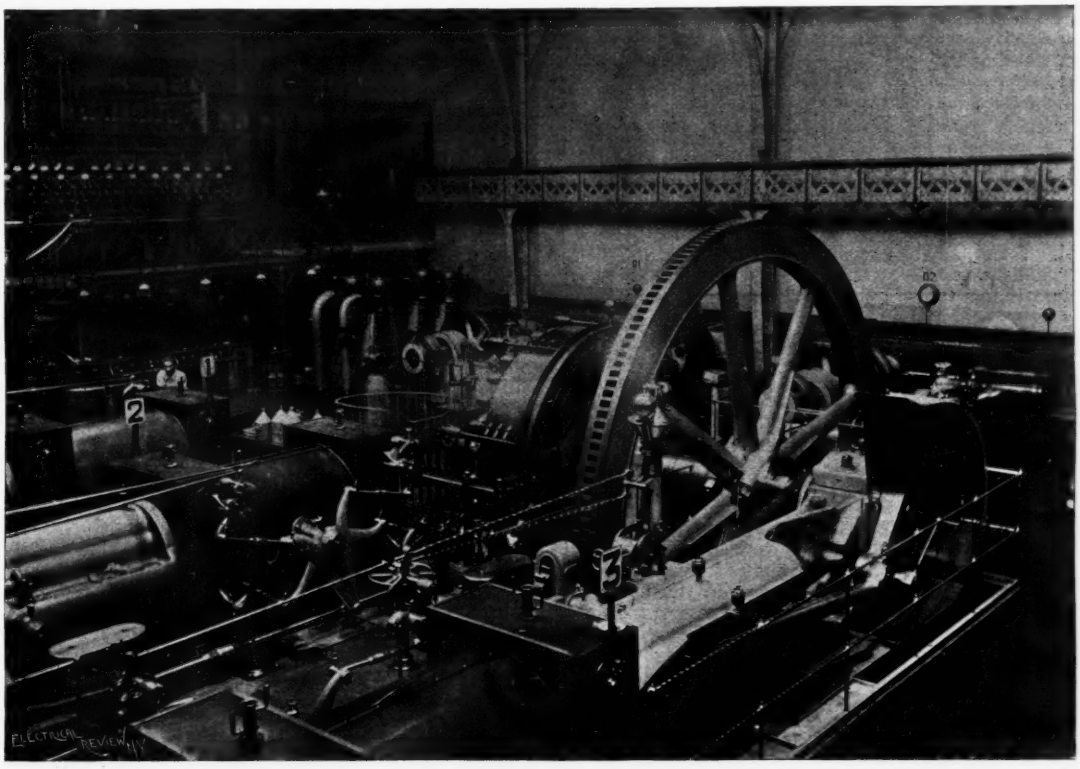


FIG. 1.—AN INTERIOR VIEW OF THE PLACE CLICHY CENTRAL LIGHTING STATION IN PARIS.

THE PLACE CLICHY CENTRAL STATION IN PARIS.

BY L. BAYLY.

This company is of comparatively recent organization, the year 1889 having first witnessed the sanctioning by the municipal council of a network of cables supplying Paris on the north bank of the Seine with electricity for lighting purposes. Since then, important additions and extensions have been made, the actual area of town covered amounting to about 520 hectares. The central station supplying this section has been set up in the Batignolles quarter, at a maximum distance of two miles from the extreme limits of electrical jurisdiction. The whole installation—dynamos, engines and motors—owes its mechanical equipment to the large organization known as the "Société Alsacienne de Constructions Mecaniques," and represents, financially, a capital of some 4,000,000 francs.

The five wire system of distribution, already successfully adopted in Vienna and elsewhere by Siemens Brothers, has here been preferred to the ordinary three-wire system in vogue in most other Paris stations—perhaps on account of the advantages it lends in enabling a large area to be supplied without the intermediary aid of transformers. On the five-wire system a current can be utilized at a tension of 550 volts on the long-distance cables without rendering feeders of undue size necessary. A tension of 550 volts offers little inconvenience

within these limits and the insulation of the entire network leaves little to be desired. In accordance with local requirements the initial electro-motive force is modified, as the case may be, to 440, 330, 220 or 110 volts, the last being the minimum necessary for incandescent work.

Besides its equipment of dynamos, the Clichy station includes a neatly arranged battery of accumulators. The hours of maximum output are—as might be expected—from sunset to midnight. After this hour the accumulators, charged during the daytime, suffice for the work of the section.

The station itself, situated in the Rue des Dames, is an imposing structure, covering an area of 1,800 square meters. It is divided into two sections, the administrative and the mechanical. The latter is a large glass-roofed building, 57 meters long by 26 meters wide, and 25 meters high. The roof itself, slanting like that of a conservatory, offers some interesting features. In a large machine-room there is sure to be a certain quantity of vapor in suspension, which, condensing on the plates of glass overhead, is apt to fall in drops on the electrical machinery beneath. To avoid this, an ingenious system of runnels has been devised, and any moisture is led away harmlessly down the four zinc water-pipes lining the corners of the room.

The boilers—12 in number—are placed in the lower portion of the building, some 25 feet below the level of the engine-room floor. Two side galleries furnished with trolleys allow the coal to be brought directly from the street. An hydraulic ash-lift serves to cart away the refuse from the furnaces. The boilers, as is generally the case in installations where the required heating surface is large and the available space small, are of the multitubular pattern. Each boiler is surmounted with a reservoir of water, which also serves as filter. The pressure used is comparatively low, the boilers being tested to 90 pounds. The heating surface amounts to 245 square meters—making a total for the 12 boilers of 2,940 square meters. The grate-area is five square meters per boiler, and the feed is accomplished by either steam pump or injector.

Nine engines are actually in use, of which three have boilers of 500 horse-power apiece.

The water for the boilers is taken from a reservoir supplied by pipes from the Seine. For economical purposes, the water supply is conducted to the boilers in a series of double tubes—the inside one containing the water, the outside one containing exhaust steam. The water is thus already heated to 90 degrees by the time it reaches the feed pumps. Four sets of boilers are actually in operation, although arrangements are in progress for increasing the plant.

The three Corliss engines are of the one-cylinder type and work without condensers. The cylinders themselves are surrounded by steam cushions supplied from the boilers. Each engine is furnished with a regulator, enabling the speed (64 revolutions) to be reduced at will.

The diameter of the cylinders is 30 inches; the stroke five feet. The shaft is supported on three pillars of cast-iron; between the first and second is the flywheel (weight, 20,000 kilograms), between the second and third the dynamo.

The remaining six engines are of the vertical type, recalling marine engines in appearance and calling for no special notice. They are from the workshops of the Compagnie Alsacienne, and give an output of 500 horse-power apiece.

The total motive power now available amounts to some 4,500 horse-power, sufficing for the maintenance of some 60,000 lamps of 10 candle-power each.

The dynamos are of the pattern already referred to in the description of the Quai Jemmappes station (see ELECTRICAL REVIEW, August 24, 1898). The variations in construction are very slight.

The output of each dynamo amounts to some 700 amperes, at a tension of 450 to 510 volts. The magnets are shunt-wound. The weight of the armature, counting the eight-pointed iron star supporting it, reaches 10,100 kilograms. The equipment of switches, ammeters, etc., is perhaps the most perfect in Paris.

The switchboard proper presents the appearance of a vast panel, 30 feet long by 18 feet high, crossed by slender iron balconies. The panels themselves are of white marble, and the whole appearance is as decorative as it is neat. On the lower story, controlled from the first balcony, are placed the commutators regulating the magnetic fields of the dynamos. The large army of rheostats occupies a room by itself, ventilated by an electrical fan.

From the second story run the feeders—21 in number—each having its own cut-out, voltmeter and ammeter. The feeders pass behind the marble back of the switchboard down into the cellar through rectangular wooden conduits and out into a tunnel built under the street commanding the network of cables.

The battery of accumulators deserves a word of mention. As already stated, the engines work only until midnight, all the required energy after this hour being supplied from the cells. This arrangement has the advantage of doing away with the habitually careless service of men obliged to work during the small hours of the morning. All hands are dismissed at midnight, and the accumulators continue the work alone till daybreak.

The batteries are set up in the basement on a double grating of iron divided into two stories. A well known accumulator firm in Paris, the Société pour le Travail Electrique des Métaux, is under contract to look after these cells independently of the station employés.

The method of charging is worthy of note. A mechanical transformer has been devised for the purpose of increasing the voltage of the dynamos. As we have mentioned, the usual voltage employed amounts to some 450 volts. It follows, therefore, that the actual tension in the mains is not quite sufficient to charge 250 cells coupled in series, especially if it becomes a question of charging within a certain time; 600 volts are, therefore, needed. It would have been possible to obtain these by a very slight variation in the winding of the dynamo armatures, but the necessity of feeding the mains at lower tension would have been productive of complication. Under the circumstances it was thought better to augment the voltage of the establishment by placing an extra dynamo in connection with the accumulators. This dynamo might easily have been set in action by a few yards of shafting and a belt, but, for reasons concerning the general disposition of ground space, it appeared preferable to employ an electro-motor. Actuated by this motor, the dynamo produces a current of 200 amperes under an electro-motive force of 150 volts. The efficiency of the arrangement is about 80 per cent. The diagram sketched for me by the chief engineer is sufficiently interesting to make it worth reproducing. (See Fig. 2.)

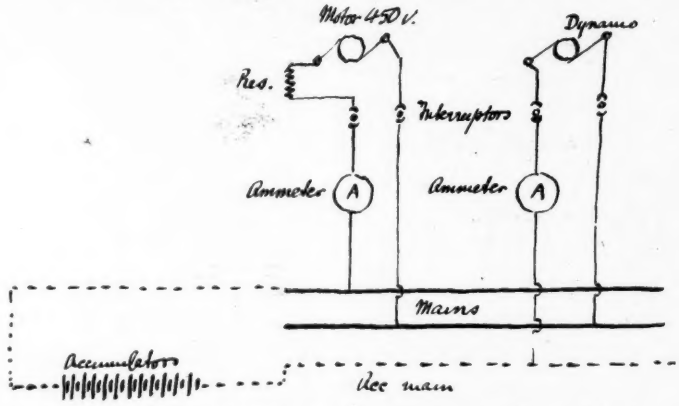


FIG. 2.—METHOD OF CHARGING ACCUMULATORS AT THE PLACE CLICHY CENTRAL STATION, PARIS.

It is a noteworthy fact that a somewhat similar device has been employed in certain hydraulic stations—Geneva, for instance—to create a slightly increased pressure at some point along the mains where the initial force is not sufficient for local purposes.

American Institute of Electrical Engineers.

The 129th meeting of the Institute was held at 12 West Thirty-first street, Wednesday evening, November 23, President Kennelly in the chair. The paper of the evening on "The Design of Transformers," by F. W. Carter, of London, Eng., was read by Prof. W. S. Franklin, of Lehigh University, in the absence of the author. It was discussed by Messrs. Franklin, W. B. Jackson, Wolcott, Henshaw, Torchio and others. At the meeting of the executive committee in the afternoon the following associate members were elected:

Cleveland Abbe, professor of meteorology, the Weather Bureau, Washington, D. C.; residence, 2017 I street, N. W., Washington, D. C.; John Cassiday, superintendent Mutual Telephone Company, Honolulu, Hawaiian Islands, U. S. A.; James Francis Cosgrove, head of locomotive engineering department International Correspondence School, 631 Madison avenue, Scranton, Pa.; Donald Hume Fry, assistant to Robert McF. Doble, 202 Sansome street, San Francisco; residence, Blue Lakes City, Cal.; James Hamilton, patent attorney and expert in patent causes, 54 State street, Boston, Mass.; Bernhard Hoffmann, New York Telephone Company, 15 Dey street, New York city; Harry D. James, expert draughtsman, Otis Brothers & Company; residence, 100 Buena Vista avenue, Yonkers, N. Y.; S. L. G. Knox, first assistant engineer Crocker-Wheeler Electric Company, Ampere; residence, Montclair, N. J.; Howard Wallace Leitch, switchboard regulator, the Edison Electric Illuminating Company; residence, 373 Madison street, Brooklyn, N. Y.; R. W. Lohmann, electrical engineer, 1387 Madison street, Oakland, Cal.; C. Stowe Reno, electrical engineer Triumph Electric Company, 620 Baymillen street, Cincinnati, Ohio; R. H. Sperling, assistant engineer British Columbia Electric Railway Company, Limited, Victoria, B. C.; James Wilkinson, station manager, chief engineer Consolidated Electric Light Company, 812 South Nineteenth street, Birmingham, Ala.; A. Wilford Zahn, electrical engineer and superintendent Manhattan Light, Heat and Power Company, Manhattan Building, St. Paul, Minn.

The following associate members were transferred to full membership: Franklin Robert Anson, secretary and manager Salem Light and Traction Company, Salem, Ore.; Sidney Hand Browne, consulting electrical engineer, Baltimore, Md.; A. E. Brooke-Ridly, agent and electrical engineer Siemens & Halske Electric Company, San Francisco.

The committee on co-operative research, having completed the first stage of its work, has sent various collegiate electrical engineering departments an explanatory circular submitting 37 subjects for investigation.

SURFACE CONTACT ELECTRIC RAILWAYS.

READ BEFORE THE NEW YORK ELECTRICAL SOCIETY, NOVEMBER 17, 1898, BY EDWARD H. JOHNSON.

In considering the problem of electrically operated surface railways, as in considering other problems, one inventor will, from motives of expediency, follow the general trend of the commercial evolution of his art, while another will look beyond and seek that solution which shall possess the element of permanency by virtue of being founded on correct theory.

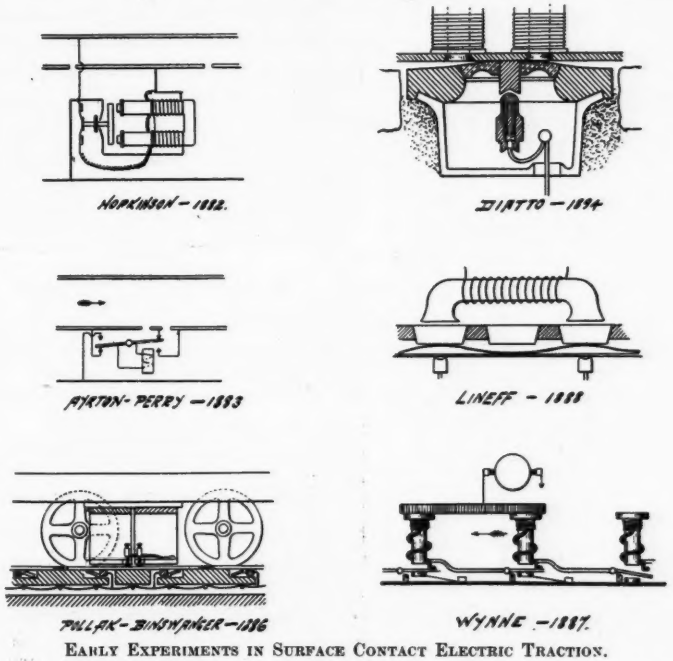
In no branch of modern electrical development has this divergence of inventive tendency been more marked than in that of electrical distribution for tram-car service. The quick, cheap and effective overhead trolley afforded the "expediency" inventor a fruitful field. It was a rich harvest, but it was a harvest of one season only. That season has passed. The phenomenal success of the electric tram-car has in itself forced a "Public Opinion" in antagonism to the overhead supply system, hence the "expediency" inventor is again requisitioned, and, following his nose with the instinct of his class, says "Take the trolley off the poles and string it in a cable slot." The fact that electricity and water are mortal foes, and that a cable conduit is nothing more or less than an open street sewer, has no weight with him, since his client's margin of earnings is sufficiently great to permit not only of enormous expenditure for a construction that will secure drainage, but also for paying the considerable cost of the excessive leakage inherent in the system.

It thus comes to pass that in metropolitan streets, where the traffic is of "bonanza" proportions, the problem of complying with a public demand may be, and is being, met by a brute force solution—a solution neither in consonance with scientific or commercial principles.

That such a solution of the problem is no solution at all, for at least 99 per cent of the tramways of our American cities, can easily be demonstrated by a comparison of their possible net earnings and the interest on the great investment demanded by it.

A further development of the art is, therefore, essential and the brother inventor must now, perforce, be granted a hearing. Of him is required a solution of the problem which shall possess the element of permanency and which shall yet not demand an investment of prohibitive proportions. Immediately this inventor opens with his plan, it is recognized as an old acquaintance, to whom not much attention has hitherto been paid and who has, in the whirl of expediency, been passed by with a gesture of impatience. Present necessity, however, now secures the recognition heretofore denied, and, lo! it is discovered that not only is the plan a true solution but that it was, as a matter of fact, evolved fundamentally from the brain of the late and lamented Dr. Hopkinson 16 years ago, and it is safe to say that had it met with a tithe of the encouragement given to its overhead and open conduit brothers, it would have been more speedily perfected, and neither the overhead nor the underground trolley would to-day exist upon a single important street in either town or city.

An important factor, effective in retarding the development of a sound system, has been the unwillingness of the larger street railway syndicates to see any underground system a demonstrated success. Their overhead charter rights generally contain an obligation to substitute such a system on proof of its practicability, hence their determination to damn it in the eyes of the public and municipal authority. Even yet the corporations owning franchises, while suffering their associates to develop the costly open conduit in the great and wealthy metropolis, having no fear of its being forced upon their less prosperous lines in minor cities, assume a position of determined hostility toward the cheaper and superior system, knowing full well that a single demonstration of its practicability in New York would promptly compel its general adoption in Philadelphia, Boston, Chicago and elsewhere.



EARLY EXPERIMENTS IN SURFACE CONTACT ELECTRIC TRACTION.

The surface contact system, as its name implies, delivers the current to the moving car by virtue of contact between a bar or "skate" carried by the car and sectional-conducting metals fixed in the surface of the roadway. The mere statement of the general conditions suggests as an essential requisite that the current shall be there for the car only, and not for the horse or other street user. This in turn implies the automatic charging of the surface contact points when needed by the car and their automatic discharge when the car has passed, by means of some force associated with the car itself, and, since we are dealing with currents of many horse-power, it follows that the individual factors in this automatic operation must be absolutely reliable. In fact, the devices employed for the discharge of the current at least must be infallible. Nothing less will avail, since there can be no divided responsibility for accidents resulting from the use of such a system. A live section is as innocent looking as a dead one. It gives no notice to the street user, and hence he is not charged with the responsibility of avoiding it. Under these circumstances the law would promptly condemn the system and compel its abandonment upon its first offense.

One deterring force of substantial weight, which has operated to keep this system in the background, is the common impression that these automatic factors could not be so designed as to at all times and under all circumstances possess this property of infallibility. Mr. Lundell and I have, however, held to the contrary, and, after more than three years of almost continuous experimental work and practical demonstration, are now able to challenge those who hold otherwise to place their finger upon a weakness in the system which, if accidentally developed, would result in a dangerous electrification of the street.

The history of the origin and evolution of the surface contact idea is too varied and voluminous to be recounted in a brief paper, but I have prepared a few illustrations of the most ambitious efforts that have been made from Dr. Hopkinson down to our own, and will note briefly their salient features.

Dr. Hopkinson, in 1882, the originator of the idea of surface contact, had only in mind the prevention of heavy leakage from a commercial point of view and not at all as a matter of securing safety. Hence, his electrical connections were not designed and could not be considered for a moment as factors of safety. He simply overlooked the point of vital importance.

Ayerton & Perry, in 1893, simply diversified the electrical connections in many ways, but clearly with only the Hopkinson end in view. Their system was thus not superior to Hopkinson's, and, therefore, no better adapted to secure safety.

Pollock & Binswanger, in 1886, were among the first to recognize the importance of safeguarding the street, and they adopted the idea of operating switches in the street by electromagnetism developed on a moving car. They have had many followers, among whom may be mentioned Wynne, 1887; Lineff, 1888, and Diato, 1894.

The principle has, however, been found inadequate because unreliable at high speeds, a fact readily comprehended by those who understand the laws governing magnetism.

The latest candidate for honors in surface-contact development is Prof. Sylvanus P. Thompson, who endeavors to combine the good points of the electro-magnetic switch system with the good elements of the pure "magnetic pick-up" system. The result is, however, not a happy one, as it involves the switch in complication, whereas, as every engineer and mechanic knows, an essential condition of infallibly operative mechanism is that it shall be reduced to the last stage of simplicity; viz., a weight falling in free air.

As these multifarious steps in the evolution of the art have been taken, it has become more and more apparent that the positive-acting electromagnetic switch energized directly by an ample electric current and possessing, as it does, the quintescence of mechanical and electrical strength and simplicity, will alone yield the positive and reliable results demanded in railway work.

Moreover, as it has been found that a certain "time allowance" for the operation of the switches is essential for high-speed work, a duty requiring the switch to operate before it is reached by the contact shoe of the car, it is, of course, apparent that since the electro magnetic switch is the sole device capable of responding at a distance, it alone is equal to such duty.

Mr. Lundell and I have from the outset recognized these severely exacting conditions and have, accordingly, based our work entirely upon the electro-magnetic switch and sought to reduce it to the acme of simplicity and consequent reliability, as well as to evolve a system of circuit connections equal to every requirement of speed, direction, capacity, economy, reliability and safety. These results we not only claim to have achieved, but, in doing so, to have produced a system so inexpensive as

(Continued on page 346.)

HIGH-VOLTAGE POWER TRANSMISSION.

READ BEFORE THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, OMAHA, JUNE 30, 1898, BY CHAS. F. SCOTT.

(*Continued from page 331.*)

The loss over the surface of insulators was quite small; in fact, almost insignificant compared with the amount of power which would ordinarily be transmitted. The various displays of energy about high tension wires led us to investigate and determine whether this loss was one of importance. In order to measure the loss between wires, eliminating what occurs on the insulators, it was desirable to have a considerable length of wire; to support it without insulators, and, preferably, to arrange the wires in such a form as to give a considerable loss. Nine wires, each 60 feet long, were stretched four inches apart in a horizontal plane, and were held in place by strings, several feet in length, at each end. The wires were No. 19, Browne & Sharpe gage, 0.036 inches in diameter. They could be connected in various ways, and any pair or pairs of wires could be omitted as desired.

The power supplied to the raising transformer was measured by a wattmeter placed in the primary low tension circuit. When the load was placed on the transformer the wattmeter reading increased, and the amount of increase was taken as the power delivered to the load. This method involves certain errors—which will be pointed out further on—but, on the whole, it gives an approximate and fairly correct indication of the power, and is sufficient to show clearly the general form of the loss curves and a number of interesting characteristics.

The first measurements of this loss are recorded February 26, 1895. The first, third, fifth, seventh and ninth wires were connected in multiple to one terminal, and the other wires were connected to the second terminal of the raising transformer; successively increasing voltages were applied.

The wires began to give a hissing or a crackling sound and in the dark began to appear luminous at a little below 20,000 volts. As the voltage was increased the sound became more and more intense, the wires vibrated and became more and more luminous, until at the higher voltages they were surrounded by a coating of soft blue light many times the diameter of the wire. Often there were bright points along the wire, probably corresponding to bits of dust or rough places resembling points on the wire. The large room soon became strongly charged with ozone.

Results of measurements on all wires, alternate wires being connected together to one terminal, and the intermediate wires to the other terminal of the raising transformer, are given in the accompanying Fig. 1. Three curves are given for a frequency of 60 periods per second, or 7,200 alternations per minute. Two of these curves give the wattmeter readings for the different voltages, one for the transformer alone and the other for the transformer and high-tension wires; the third curve gives the difference between the two, and therefore represents approximately the loss on the high tension wires. Corresponding curves are given of tests made at a frequency of 133. The loss in the transformer is less at the higher frequency, but the loss on the high-tension wires is almost the same for both frequencies. These losses are very small below 18,000 volts, but

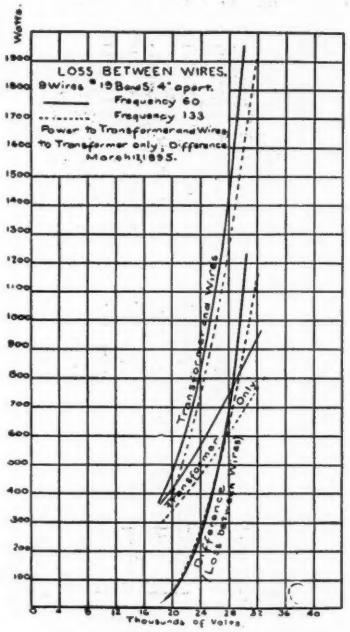


FIG. 1.—RESULTS OF WIRE MEASUREMENTS, HIGH-VOLTAGE TRANSMISSION.

increase rapidly up to 30,000 volts, which is about the highest pressure used.

As the two sets of tests were made with dynamos having different characteristics, they may not accurately represent the relative effects of the frequencies. The difference due to causes other than the frequency are, however, probably small, so that these tests are correct in showing the general relation between the loss and the pressure, and in indicating that the loss depends little if at all upon the frequency.

Tests were made with different numbers of wires. In one case the measurements were made with the arrangement described above, in which five wires were connected together and the four intermediate wires were connected to the second terminal of the raising transformer. Two wires at one end were then left off. Two of these were next omitted, leaving three connected to one terminal and two to the other. One of these was left off, leaving the first and third wires connected together, and the second and fourth also. The first and ninth wires were then connected together, also the second and eighth. As the first and second wires were well separated from the eighth and ninth, the mutual effect between them is negligible, so that the loss in this case may be considered as double that which would be obtained from the first and second wires alone. The results of this measurement are plotted in Fig. 2. The points for both loss and current fall on a straight line and indicate that each additional wire causes a definite increase.

Measurements made upon wires at greater distances show that the action is considerably less as the wires are separated. The loss is approximately the same at 28,000 volts, when the wires are four inches apart, that it is

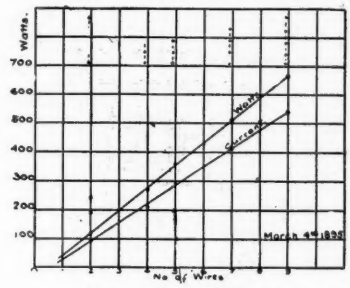


FIG. 2.—RESULT OF WIRE TESTS.

at 36,000 volts when they are 16 inches apart. The loss for a distance of eight inches is intermediate.

Other measurements were made,

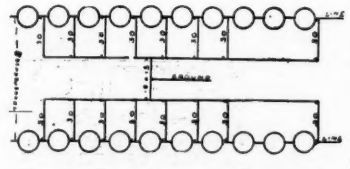


FIG 3.—CONNECTIONS OF LIGHTNING ARRESTERS.

but nothing of further importance was developed. It is interesting to note that within a few days of the first measurements the general characteristics of this loss were determined; namely, that the loss between wires increases rapidly after a critical voltage is reached, that the loss is practically independent of the frequency, that it is much less as the distance between wires is increased. When a loss of 1,200 watts was obtained on a total length of 540 feet of wire at only 30,000 volts, the important bearing of this phenomenon upon transmission became very evident. The tests were stopped as preparations were begun for the continuation of the work at Telluride.

The original Telluride plants operated at 3,000 volts. Both the generator and the synchronous motor were wound for this pressure. Two transformers were furnished for the high-voltage tests, one for raising the generator voltage for transmission and the other for lowering the voltage for the motor. The windings were connected with a number of terminals by which the high-tension voltage could be varied over a wide range up to 60,000 volts.

Coils of similar shape were placed side by side in what is known as the "parallel" form of construction. Each coil had many layers of wire and but few turns per layer, thus securing a small difference of pressure between consecutive layers. The high-tension winding was divided into four similar coils, each designed to give a maximum of 15,000 volts. The individual coils could be differently connected, either in series or in multiple. The low-tension coils were five in number and were provided with loops, by which the number of effective turns could be varied. Three low-tension coils were placed between two pairs of high tension coils, and the two remaining low-tension coils were placed on the two ends. Between the low-tension and high-tension coils metallic shields were placed, which were connected to the ground for protecting the low-tension circuit from danger in case of accidental contact with the high-tension circuit, and also for screening the low-tension circuit from electro-static induction from the high-tension windings. The transformer was immersed in a case containing oil. The iron and the case of the transformer, as well as the shields between the cells, were connected to the ground.

There was also an auxiliary transformer, whose primary was connected across the generator terminals, while its secondary was placed in series with the circuit to the raising transformer, thus either raising or lowering the generator electro-motive force as desired. The secondary had a number of steps so that the voltage could be varied at will.

The line extends from the power station near Ames, which is a few miles from Telluride, Colo., to the Gold King mill. The line passes over an exceedingly rugged country and has a total length of nearly two and one-fourth miles (11,720 feet). There are 62 poles, each carrying three cross-arms, the upper being about 26 feet from the ground. Each cross-arm carries two wires supported by insulators which are designated as follows: Large glass, small glass, porcelain. The large glass insulator is the same as that used on the circuit in the San Bernardino and Pomona plant. The total height is five inches and the maximum diameter five and one-half inches. The bottom of the insulator stands one and one-fourth inches above the cross-arm. The porcelain insulator is four and one-sixteenth inches high and five and seven-eighths inches in diameter. The bottom is three and one-sixteenth inches above the cross-arm. The small glass insulator is three and one-half inches in height, four and one-fourth inches in diameter and stands two and one-fourth inches above the cross arm. This insulator is triple petticoat; the other two insulators are double petticoat. The circuits were strung with galvanized iron wire 0.165 inch in diameter, which is No. 8 B. W. G., and about No. 6 Brown & Sharpe

gage. Later the circuit on porcelain insulators was changed to No. 6 Brown & Sharpe copper wire 0.162 inch in diameter. The measured resistance of one of the iron wire circuits was 66.25 ohms at —seven degrees centigrade.

The lightning protection was laid out by Mr. A. J. Wurts, who previous to this time had spent some months at Telluride, determining the requirements for protecting the 3,000-volt circuit. The protection consists of choke coils and spark gaps of non-arcing metal, as described by Mr. Wurts in his paper before the insti tute, March, 1892.

In each line 10 choke coils were placed. Unit arresters, each consisting of seven non-arcing metal cylinders and having six spark gaps, were connected as is shown in Fig. 3.

(To be continued.)

OBITUARY.

William E. Hale, a well known Chicago capitalist, died at his residence, on Drexel Boulevard, on November 16, after an illness of four weeks' duration. Mr. Hale was a heavy stockholder in the Toledo, Ohio, Traction Company. At the time of his death he was treasurer as well as a director of the company.

Col. Henry Lee, formerly senior partner of the banking firm of Lee, Higginson & Company, in Boston, died suddenly at his home in Brookline, Mass., on November 24. He was 81 years old. He was one of the leading promoters of the American Bell Telephone Company. He was born in Boston, September 2, 1817, and graduated from Harvard in 1836. He had been an overseer of Harvard University for 30 years.

Electric Light Machinery Wanted.

The ELECTRICAL REVIEW is informed by a correspondent that the local electric light plant at Hattiesburg, Miss., will have to be enlarged to two or three times its present capacity and that the company will be reorganized with a considerable increase of capital. Those interested in supplying the needed increase of plant should correspond with Mr. W. W. Bostwick, the manager, who will take charge at once.

ROENTGEN LIGHT NOTES.

BY WILLIAM ROLLINS.

NOTE XLI—ON TEMPERATURE.

As in every particle which is raised to a high temperature by its impact upon the target, the heat* must afterwards decline, a tube that is generating Roentgen radiations of short wave length is at the same time producing other radiations composed of longer waves down to, including and below those of ordinary light. This would be true, even if we could imagine the particles of the cathode stream to be annihilated after their heat of impact had departed. As, however, they rebound from the target, many of them striking the glass walls of the tube, this second impact not only produces luminescence of these walls, but again raises the temperature of the particles sufficiently to make a second source of Roentgen radiation, of longer wave length, in all cases where the initial velocity was very high. This is one reason why powerfully excited tubes of the ordinary reflecting form give less perfect definition than less excited ones. In the former, the source of Roentgen radiation, not being confined to the target, consists of a bright central nucleus surrounded by a less bright halo, which is due to the rebounding particles striking the glass wall, as well as by the impact of the anode rush, described in notes 17 and 21; hence the importance of a diaphragm.†

Even with this means of reducing the area of the source of utilized energy we do not get sharp definition from a highly excited tube of the ordinary reflecting focus type, without too much limiting the field, for anything but small objects, though by a modification, which consists in placing very near the target a piece of insulated opaque metal with a hole in it through which the radiations must pass before they can reach the object to be examined, I have obtained better results. Figures of these tubes will be published later if the matter is of sufficient interest. With a direct-acting tube, such as was described in note 9 and afterward illustrated, the definition is always fine, however powerfully the tube is excited, the reason being that we can always use a diaphragm with a small hole without limiting the angle of the field, because the opening of the diaphragm is practically in the same plane as the source of the radiations. An improved tube of this type is shown in Fig. 41 with sufficient detail to be understood by any one who has read my previous notes. However, there is one defect in this type of tube. The impact of the cathode stream is upon aluminum or other light metal, so that the wave length of the radiation produced by the same electro-motive force is longer than in a tube of the reflecting focus type, where the impact of the cathode discharge may be upon platinum or heavier metals. In this connection it would be well to refer to note 35.

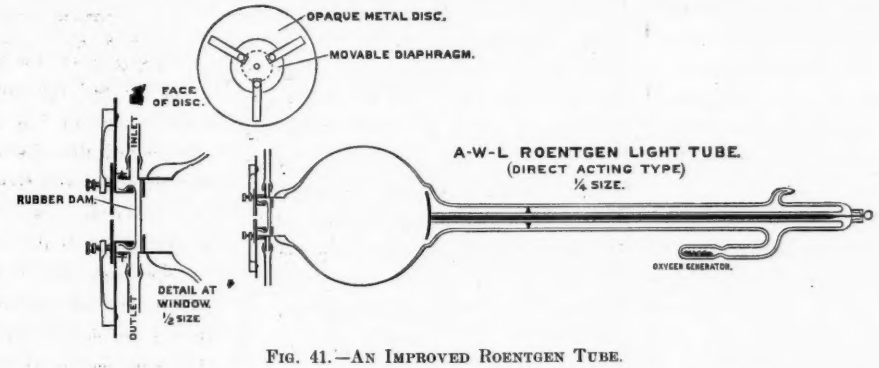


FIG. 41.—AN IMPROVED ROENTGEN TUBE.

*Note XXX, ELECTRICAL REVIEW, August 3, 1898.
†Note XXVI, ELECTRICAL REVIEW, August 17, 1898.

The American Electro-Therapeutic Association.

The eighth annual meeting of the American Electro-Therapeutic Association was held September 13 to 15, at Buffalo, N. Y., in the Library Building. The association was welcomed to Buffalo by Dr. Conrad Diehl, the Mayor; the address of welcome was responded to by Dr. F. B. Bishop, of Washington, D. C. Among the list of papers read were the following:

"The Diagnostic and Therapeutic Relations of Electricity to Diseases of the Central Nervous System." By Dr. A. D. Rockwell, New York.

"New Uses of the Undulatory Current in Gynæcology." By Dr. George Apostoli, Paris, France. (Read by Dr. G. B. Massey.)

"Electricity in the Treatment of Uterine Fibromata." By Dr. Felice La. Torre, Rome, Italy. (Read by Dr. John Gerin.)

"The Use of Electricity in Gynæcology." By Dr. William J. Herdman, Ann Arbor, Mich. (Read by title.)

"The Treatment of Uterine Fibroids by Small Currents Administered Percutaneously." By Richard J. Nunn, Savannah, Ga.

"Treatment of Menorrhagia by Weak Current and Silver Internal Electrode." By Dr. Adelstan de Martigny, Montreal, Que. (Read by Dr. W. H. White.)

"The Method for Using Cataphoresis in Conjunctival Inflammation." By Dr. Lucien Howe, Buffalo.

"Electricity in Deafness and Stricture of the Eustachian Tube." By Dr. Robert Newman, New York.

"Electricity in Acne Vulgaris and Acne Rosacea." By Dr. Grover W. Wende, Buffalo.

"High-Tension Current in Neuritis." By Dr. Francis B. Bishop, Washington, D. C.

"Electricity in the Treatment of Goitre." By Dr. Charles R. Dickson, Toronto.

"The Effect of Electricity upon Tissue Metabolism." By Dr. William J. Herdman, Ann Arbor, Mich., and Dr. J. H. Kellogg, Battle Creek, Mich. (Read by title.)

"The Galvanic Current in Gynæcology." By Dr. G. Betton Massey, Philadelphia, Pa.

"Some Surgical Uses of Electricity." By Dr. Charles R. Dickson, Toronto.

"Combined Use of Medicinal and Electrical Treatment in Some Affections of the Eye." By Dr. G. Herbert Burnham, Toronto. (Read by title.)

"Electricity in Genito-Urinary Diseases." By Dr. Robert Newman, New York.

"Treatment of Malignant Growths by Means of Electricity." By Dr. G. Betton Massey, Philadelphia, Pa.

"Orthopædic Uses of Electricity." By Dr. Louis A. Wiegel, Rochester, N. Y.

"The Functional Neuroses, with Special Reference to Neurasthenia; Their Pathology and Treatment." By Dr. A. D. Rockwell, New York.

"Electricity in Diseases of the Nervous System." By Dr. W. J. Herdman, Ann Arbor, Mich. (Read by title.)

"A High-Frequency Oscillator for Electro-therapeutic Purposes." By Nikola Tesla, New York. (Read by Dr. W. H. White.)

"The Hydro-electric Bath with Sinusoidal Current in Diseases." By Drs. Georges Gautier and J. Larat, Paris, France. (Read by title.)

"The Use of the Hot Air and Light Bath in Disease." By Drs. Georges Gautier and J. Larat, Paris, France. (Read by title.)

"The Electric Arc Bath." By Dr. Margaret A. Cleaves, New York.

"The Electric Light Bath." By Dr. J. H. Kellogg, Battle Creek, Mich. (Read by title.)

"Some Suggestions on the Possibilities of Cataphoresis." By Mr. John J. Carty, E. E., New York.

"The Effect of High-Tension Discharges upon Micro-organisms." By Drs. J. Inglis Parsons and C. Slater, London, Eng. (Read by title.)

"The Action of X Rays upon Tuberculosis." By Drs. J. Bergonie, Bordeaux, and Teissier, Paris, France. (Read by title.)

"Two Years of Practice in Radio-therapy." By Drs. Georges Gautier and J. Larat, Paris, France. (Read by title.)

The following officers were elected: President, Dr. Francis B. Bishop, Washington, D. C.; first vice-president, Dr. Ernest Wende, Buffalo, N. Y.; second vice-president, Dr. W. H. White, Boston, Mass.; secretary, Dr. John Gerin, Auburn, N.Y.; treasurer, Dr. Richard J. Nunn, Savannah, Ga.

Executive committee: Dr. Robert Newman, New York, for three years; Dr. G. Betton Massey, Philadelphia, Pa., for three years; Dr. A. D. Rockwell, New York, for two years; Dr. Wm. J. Morton, New York, for two years; Dr. Charles R. Dickson, Toronto, Ont., for one year; Dr. Frederick Schavior, Stamford, Ct., for one year.

Next place of meeting, Washington, D. C., September 19 to 21, 1899.

A resolution was passed calling on colleges and medical schools to devote more time to the teaching of electro-therapeutics and drawing the attention of the Association of Medical Colleges to the necessity of the same. The University of Buffalo was congratulated upon having shown its progress by establishing a chair of electro-therapeutics in connection with its medical school.

An electric car of the Tacoma, Wash., Railway line was recently derailed five miles from the city on the Steilacom Road, because, it is said, the controller failed to shut off the current on a heavy down grade. The car was smashed to splinters by striking the side of a cut, 10 feet deep, through which it was traveling. Seven persons were aboard, and all received injuries.

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SPECIAL NOTICE TO ADVERTISERS.

CHANGES for advertisements must be in this office by Friday noon for the following week's issue. NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.

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Out in Omaha they are said to have an Anti-Crowding Car Society, and, when its members ride on a trolley car that is being occupied beyond its normal capacity, they inform the conductor that if he lets any more passengers on he will go overboard. Such a scheme is almost ideal, but if it were attempted in New York city about 200,000 people would never get home at night.

News comes from Philadelphia that the directors of the company intend to ask Edison to develop the work the death of Keely left unfinished. We predict that Edison will have a "previous engagement" with more important work.

Prof. Henry A. Rowland, the distinguished physicist of Johns Hopkins University, believes he has perfected a twelve-message telegraphic system—a decided advance on the quadruplex so universally used. A trial is now being made on the Pennsylvania Railroad, and we shall be pleased to learn of its successful issue.

The people in Brooklyn, N. Y., have developed a new form of amusement called "X-ray parties," where the guests assemble and examine their respective anatomies through a fluoroscope. This is an innocent form of enjoyment, provided a competent operator is in charge of the apparatus. X-ray burns are not in the least enjoyable or amusing.

Our terra-cotta contemporary editorially tells its friends who will insist that it "makes" great men, that such praise is not deserved. Perish the thought that this protest is prompted by any unsuccessful experiments in a field of effort so exclusively its own! Rather is it prompted by that shrinking modesty which would stem the swelling tide of tribute that, perchance, is beginning to pall on sated minds. Even at the risk of being thought to protest too much, the editors beg for relief from that embarrassment of praise that a thoughtless world sometimes inflicts on bashful souls. Yet in their inner consciousness these, our brethren, must feel that such honors are deserved.

The ELECTRICAL REVIEW has observed the fact that there has been a great deal of most commendable telephone development throughout the United States. It is but just to say that a great deal of credit is due to the manufacturers of so called independent apparatus, and additional telephone exchanges have been constructed in recent years throughout the country, more particularly in the middle and western states. Many of these new exchanges are constructed on technically correct principles, and furnish service satisfactory to patrons. Other exchanges have been hastily constructed in a crude way, but are gradually being changed and improved, constantly widening the scope and extending the popularity of the telephone.

M. Riban has lately presented to the Council of Public Hygiene of the Department of the Seine a report on a new method of preparing white lead by electricity. A mixed solution of carbonate and chlorate of soda is subjected to the process of electrolysis. Chlorate of lead is formed at the anode or lead plates by which the current enters the solution, and soda at the plates by which it leaves. The chlorate of lead forms, in contact with carbonate of soda, the hydrocarbonate of lead. The bath is agitated so as to keep it homogeneous, and let the white lead fall to the bottom as it is formed. The soda is afterwards treated by a current of carbonic acid gas, which regenerates the carbonate of soda. This process, it is thought, will probably lead to economic results.

THE STORM.

The eastern coast of the United States was visited by an unusually severe snow and wind storm last Saturday. In parts of New England two feet of snow fell, and drifts 15 feet deep were not uncommon. In New York city about a foot of snow fell and the wind reached 40 miles an hour. At Block Island the gale blew 60 miles an hour.

Railroad trains on all the principal steam roads were stalled along the line, the Sound steamers ran for the nearest port or a lee anchorage and interurban traffic almost came to a standstill. The telegraph lines stood up fairly well and only a few points were cut off. The telephone wires also stood the strain well, but along the exposed New Jersey coast a number of circuits gave way under the fierce blasts and the accumulated snow.

In New York city and Brooklyn the electric-car service was severely crippled for several hours. The storm was so severe that it was almost impossible to keep the tracks clear. The underground trolley lines in New York city on Lenox, Amsterdam, Fourth, Sixth, Second and Madison avenues were put to their first severe test, and gave way under it for some hours. Fourteen big electric sweepers were kept running as long as possible and large numbers of men were kept sweeping and shoveling. But the snow was too wet and heavy and soon all the lines were tied up. The ice forming in the conduits caused so much leakage that the power stations could not build up the loss. It was the worst storm an underground trolley system could be called upon to face.

WALL STREET AND THE ELECTRICAL STOCK MARKET.

The controlling influences in the stock market during the past week were practically the same as those that have been effective since Election Day. These are, briefly, cheap money, active trade, producing large railway earnings, and a constantly increasing business confidence. Although the dealings in stocks during the week were smaller than those of the previous week, the prices in general were higher than at the close of the exchange last Saturday. The trend of the market seems to be upward.

On the New York Stock Exchange General Electric closed at 82⅜ bid and 82½ asked, a gain of ¼ point for the week. Western Union closed at 93⅛ bid and 93¼ asked, a decline of ½ point for the week. On the Boston exchange American Bell Telephone closed at 280½ bid and 282 asked. Erie Telephone closed at 75½ bid and 76 asked. On the Philadelphia exchange Electric Storage Battery Common closed at 50¼ bid and 50⅜ asked.

An important electric light consolidation in Connecticut is told elsewhere. The same interests that managed the recent Brooklyn consolidation are engaged, and a good technical and financial reorganization is assured. In Brooklyn the last quotation of Kings County Light stock was 135. It will go much higher, I predict.

Wall Street, November 26.

Future of the Manhattan Elevated —An Interview.

Various statements have gained credence within a few days, since Mr. Alfred Skitt was made vice-president of the Manhattan Elevated, that the change augured an immediate adoption of electric power as a motive force.

A representative of the ELECTRICAL REVIEW was pleasantly received by Mr. Skitt in his offices in the Western Union Building. The representative asked the meaning of the rumors and whether the ELECTRICAL REVIEW might, with his authority, affirm or deny these statements. Mr. Skitt replied:

"There is no reason for any publications at the present moment nor do I see likelihood of it in the immediate future. If plans are matured for this work I will certainly give the ELECTRICAL REVIEW early information."

It may be accepted, however, that the Manhattan Elevated systems will gain much through Mr. Skitt's management, for with his technical knowledge of railway work, both steam and electricity, he is fully able to grasp the greater possibilities which exist for the service with modern equipment and liberal management.

Accident at a California Power Plant.

TO THE EDITOR OF ELECTRICAL REVIEW:

A singular accident occurred on November 7 at the power-house of the San Gabriel Electric Company, near Azusa, Cal. Seventeen miles from Azusa a pole was burned down by an accidental fire, which, in falling, broke the transmitting wires, opening the circuit and allowing the Tuthill wheel to run away, bursting by centrifugal force the very heavy six-foot flywheel, throwing pieces weighing 700 pounds through the roof to a distance of 100 yards, making a complete wreck of the wheel, bending the six-inch shaft badly, breaking the controlling water-gate and allowing the water under 400 feet pressure to complete the destruction of the roof. The engineer of the company told your correspondent that no very high speed was attained, but that this particular flywheel was mounted slightly out of true on the shaft, which accounts for the serious results of the accident. The gate was supposed to be controlled by a Tuthill governor, but for some cause it failed to act with sufficient promptness.

G. W. T.

Azusa, Cal., November 20.

LITERARY.

"MATTER, ENERGY, FORCE AND WORK: A Plain Presentation of Fundamental Physical Concepts and of the Vortex-Atom and Other Theories." By Silas W. Holman, emeritus professor of physics, Massachusetts Institute of Technology. Cloth, 12mo, pp. 257, price, $2.50. The Macmillan Company, New York. Supplied by the ELECTRICAL REVIEW, Times Building, New York.

The author states that the aim of this book is not to set forth the experimental side of the subject nor to describe phenomena or laws, but rather by assuming a slight knowledge of all these to proceed in an orderly manner to develop the concepts and definitions. The hope is expressed that engineers and members of the technical professions may find in the book an aid to clear thinking in their particular dealings with the subjects treated. It is certainly true at the present time as never before that correct views of energy, force and work are necessary requisites in these professions. Physics, to be of the greatest educational value, must be presented in logical sequence. Every term must be clearly defined before being used, and no familiar word should be employed in a technical sense without being previously explained. In the first part of Professor Holman's book the definitions and views set forth constitute an attempt at clear, consecutive, individual thought. The book is constructive in spirit and not critical. The second part of the book consists of summaries of the chief theories of the nature of matter, energy and force. A valuable feature of the work is a comprehensive index.

Some stories from the experience of a famous hunter in hunting tigers on elephants; some stories from the experience of a telegraph operator and train-dispatcher, and a story of the men of the government secret service, will give a good relish of adventure to the December number of *McClure's Magazine*.

The Christmas number of *Scribner's Magazine* has several notable art features. The brilliant cover in silver, gold and colors is from a prize design by Albert Herter. There are also 16 pages of color-printing of an unusual kind—reproducing Maxfield Parrish's very original scheme of illustration and decoration, accompanying F. J. Stimson's poetical version of a scene from Wagner's "Rhine-Gold." In the article on "John Ruskin as a Painter," Mr. Spielmann has included reproductions of many unpublished paintings and sketches, secured only by reason of his long personal friendship with Ruskin. Another artistic feature is the frontispiece by the young artist, Walter Appleton Clark, whose reputation has been made in the pages of *Scribner's*.

Another Electrical Exhibition in New York.

At the annual meeting of stockholders of the Electrical Exhibition Company, held in New York city on November 21, it was unanimously decided to hold another electrical exhibition in New York in 1899. The following officers and directors of the company were elected: C. O. Baker, Jr., president; F. W. Roebling, vice-president; Geo. F. Porter, secretary and treasurer; H. H. Harrison, L. F. Requa, J. W. Godfrey, C. A. Lieb, Marcus Nathan, general manager.

PERSONAL.

The management of the Kings County Electric Light and Power Company, of Brooklyn, N. Y., has decided to retain general superintendent W. S. Barstow, of the Edison Electric Illuminating Company, as general manager of the recently consolidated company. Mr. Barstow has been for many years connected with the Edison company. Mr. E. F. Peck, who has been the secretary of the Kings County company, has been appointed assistant general superintendent. Mr. Peck has been interested in electric matters in Brooklyn for years and has been connected with the Citizens, Edison and Kings County companies.

Deputy Commissioner Walton, of the Department of Public Buildings, Lighting and Supplies, Borough of Brooklyn, New York city, last week increased the force of the Bureau of Electricity by the appointment of two inspectors of electrical conductors. The appointees are Harry Byrne and Edward Sullivan, who were upon an eligible list certified to the commissioner by the Civil Service Commission. The salary of each inspector is at the rate of $1,200 a year. Mr. Sullivan is well known among the electrical fraternity, having been formerly superintendent of the Standard Underground Cable Company, and, previous to that, electrician for the Brush Electric Company. Mr. Byrne is also a well known electrical man, having been superintendent of installation in the Electricity Building at the World's Fair, afterward electrical inspector in the City Electrical Bureau, Chicago, and for the past few years prominently identified with important construction work in the East.

An Inquiry about Tesla's Electrically Controlled Vessel.

TO THE EDITOR OF ELECTRICAL REVIEW:

I have read some of the newspaper effusions relative to Mr. Nikola Tesla's latest invention, and have noted the articles and your editorial in the issue dated the 16th instant of your valued paper. In connection therewith permit me to inquire: Has not a very serious and important consideration in the operation of Mr. Tesla's apparatus been overlooked? It occurred to me that, while the vessel is controlled primarily by means of a "coherer" which receives the "waves" from the "transmitter" on shore, this same "coherer" can also be influenced by "waves" set up and transmitted *from the vessel menaced*, and the movements of the Tesla craft made uncontrollable. The Tesla vessel would, when nearer the vessel attacked, be within a stronger field of the radiations from the latter vessel's transmitter than from the controlling transmitter on shore or elsewhere. It will be necessary for Mr. Tesla to devise some method of control that can not be counter-influenced by the enemy.

Yours truly,

N. G. WORTH.

Indianapolis, November 21.

Wonderful Tale of an Electric Snow Storm in Mexico.

[*From the Monterey, Mex., Globe.*]

Lieutenant Finley's description of the night he passed on Pike's Peak in an electric snow-storm contains some picturesque and spectacular details. He speaks of the storm as "a shower of cold fire." The snowflakes were at first ordinary flakes, falling lightly and silently, but soon they became charged with electricity, and as each one fell on the hair of the mule the lieutenant was riding it gave out a tiny spark. The mule soon shown out of the darkness as if studded with diamonds. As the flakes fell faster they would emit their tiny light as they sank into the snowdrift. Presently the wind rose, and as the storm increased in fury and the flakes became smaller each of the icy particles appeared as a trailing blaze of ghostly white light, and the noise of the innumerable electric explosions all around was like a discharge of musketry, with now and then a deafening thunderclap. According to the extremely vivid narration from which this notice of the experience of Lieutenant Finley is derived, when the storm was at its height, and each speck of falling snow was like a drop of fire, electric sparks were shaken in streams from the traveler's finger tips, as well as from his ears, beard and nose, and a wave of his arm gave the effect of the sweep of a flaming sword blade through the air, every point of snow touched giving out its little snap and flash of luminescence.

AN ANALYSIS OF TESLA'S WORK.

SOME NON-TECHNICAL VIEWS AND A RESPONSE BY TESLA DESCRIBING HIS EFFORTS IN SEVERAL FIELDS OF WORK.

The articles published below are taken from the New York *Sun*, a journal that is conservatively and ably conducted in all its scientific discussions. We consider its editorial review of Tesla's efforts and ambitions the best that has appeared, and Tesla's letter that follows will be read with interest by every one acquainted with modern electrical work. It is the first communication of this kind ever sent to the lay press by Tesla, who has been the victim of probably more forged interviews and sensational articles appearing without authority than any other inventor.

The *Sun* editorial is as follows:

NIKOLA TESLA AND HIS QUEST.

[*From The Sun, New York, November 18, 1898*]

Nikola Tesla has just made public some facts about an invention intended to make war too terrible to be prosecuted, and thus to insure peace between nations. The war with Spain drew Mr. Tesla's mind aside for the time from the line of studies which has engaged him for years. Inspired and fired by patriotism, he has applied to a war engine some of the principles which he discovered in following his inquiries into new methods of applying energy to the purposes of peace.

The success or failure of Mr. Tesla's latest invention will not turn him away from the great project which has possessed his mind for years. This, as he puts it, is to harness the sun's power to do the work of mankind. He does not mean to catch the power of the sun's rays directly, but to utilize that enormous portion of their power which is expended upon the earth's surface in sucking from sea and lake waters which are afterward precipitated upon the higher parts of the land.

That there are waterfalls upon the earth which are capable of producing all the energy which mankind uses for power, heat and light is well known. The use of water-powers, however, is limited within narrow margins, partly because of the investment cost of instalment, but chiefly because the great waterfalls are remote from the seats of population and trade. Before Mr. Tesla began his researches there was no method known by which the power generated at a remote place could be transmitted to where it was wanted except at a loss of efficiency which was prohibitory. Since that time, by the use of currents of from 10,000 to 20,000 volts, it has become possible to send electric power successfully over wires for 35 miles or more, and one plant is now building to transmit power 85 miles.

But to utilize the great water-powers of the world, the transmittal of energy for a distance of from 50 to 100 miles is hardly more useful than a reach of eight or ten miles. Mr. Tesla designs to annihilate space. He would take the power of a Niagara, transform it into an electric current, and send this without appreciable loss to any place on earth where it was needed for use. Mr. Tesla has, accordingly, devised an electric oscillator which will receive the electric current from its source and give it an intensity which, as the inventor calculates, would enable a copper thread to carry 50,000 horse-power across the ocean. Mr. Tesla claims to have discovered, furthermore, that at an altitude easily reached by balloons the rarefied air has a conductivity equal to copper, while the denser layer of air below is a non-conductor. He proposes to suspend one pole of his electric circuit in the air at Niagara Falls and the other at Paris, and to forward his current through the upper air to France, whence it shall return through the earth when its active energy has been expended in work. He believes that he will be able to make this demonstration in 1900 as an exhibit at the coming world's fair at Paris, and to drive all the machinery at that exposition with the power from our great waterfall. The significance of his success would be that coal would become a convenience instead of a necessity, and water-power and electricity would replace coal and steam for the work of the world.

Another great quest which Mr. Tesla has been conducting side by side with this—and, in fact, leading along the same lines—is for the means of producing light from electricity without heat. It was well known when Tesla began his studies that a Crookes vacuum tube could be made to glow by passing through it currents of electricity at a high tension, but no electrician could evolve from these tubes more than a phosphorescent glow. To turn this into a white light which should shine like the face of the sun itself was the problem to be solved. All his investigations led Mr. Tesla to conclude that the thing which was needed was to be able to give to electrical currents voltages enormously beyond any which had ever been produced, and then to be able to handle and control the currents thus transformed. From this need grew his electrical oscillator, with which Mr. Tesla proposes to produce a current with an intensity of 800,000 volts, capable of transmission across the Atlantic. In Mr. Tesla's laboratory the vacuum tubes glow like sunshine, and their introduction for use is waiting only for a reduction of the cost of their light to a commercial basis, a reduction which he says is near at hand.

Since Mr. Tesla began investigating the possibilities of such high-tension currents as he produces by means of his oscillator he has made some startling announcements, such as that of his ability to use the whole earth as a conductor, and to telegraph to any part of its surface from any other part, sending messages jointly to many stations, or separately to each, at will. Perhaps because none of these late triumphs of Mr. Tesla's genius have yet been brought into practical use, there are many persons who declare that he is a visionary and impractical. It must be remembered that his discovery of the rotating electric field was of as great importance in its day as are his later discoveries now. That was announced in 1882, yet it was nearly 10 years before its value was fully recognized.

The personality of Nikola Tesla is as interesting as are the results of his scientific labors. His ways of work differ radically from the methods of those who study by experiment and elimination. Tesla seldom experiments, and when he does it is to prove a theory, not to form one. In 11 years, he says, only one of his experiments has failed. His processes are mental, and at times, he declares, his mind reaches out into fields so vast that he is afraid, and recalls it. He verifies his conclusions afterward by figures and experiments.

No other great scientific genius ever turned aside from his work to devise means for putting an end to war. Others have invented guns, armor, explosives and other accessories of war, but even in these cases the inventions were in a line with work in which the inventors were already engaged. Mr. Tesla's first design was to apply his method of control to such engines as automible torpedoes, and to use these to destroy the Spanish fleets, but as he went on, the broader idea came to him to make his war machine so irresistible as to render war itself improbable.

TESLA DESCRIBES HIS EFFORTS IN VARIOUS FIELDS OF WORK.

[*From The Sun, New York, November 21, 1898*]

TO THE EDITOR OF THE SUN—SIR: Had it not been for other urgent duties, I would before this have acknowledged your highly appreciative editorial of November 13. Such earnest comments and the frequent evidences of the highest appreciation of my labors by men who are the recognized leaders of this day in scientific speculation, discovery and invention are a powerful stimulus, and I am thankful for them. There is nothing that gives me so much strength and courage as the feeling that those who are competent to judge have faith in me.

Permit me on this occasion to make a few statements which will define my position in the various fields of investigation you have touched upon.

I can not but gratefully acknowledge my indebtedness to earlier workers, as Dr. Hertz and Dr. Lodge, in my efforts to produce a practical and economical lighting system on the lines which I first disclosed in a lecture at Columbia College in 1891. There exists a popular error in regard to this light, inasmuch as it is believed that it can be obtained without generation of heat. The enthusiasm of Dr. Lodge is probably responsible for this error, which I have pointed out early by showing the impossibility of reaching a high vibration without going through the lower or fundamental tones. On purely theoretical grounds such a result is thinkable, but it would imply a device for starting the vibrations of unattainable qualities, inasmuch as it would have to be entirely devoid of inertia and other properties of matter. Though I have conceptions in this regard, I dismiss for the present this proposition as being impossible. We can not produce light without heat, but we can surely produce a more efficient light than that obtained in the incandescent lamp, which, though a beautiful invention, is sadly lacking in the feature of efficiency. As the first step toward this realization, I found it necessary to invent some method for transforming economically the ordinary currents as furnished from the lighting circuits into electrical vibrations of great rapidity. This was a difficult problem, and it was only recently that I was able to announce its practical and thoroughly satisfactory solution. But this was not the only requirement in a system of this kind It was necessary also to increase the intensity of the light, which at first was very feeble. In this direction, too, I met with complete success, so that at present I am producing a thoroughly serviceable and economical light of any desired intensity. I do not mean to say that this system will revolutionize those in use at present, which have resulted from the co operation of many able men. I am only sure that it will have its fields of usefulness.

As to the idea of rendering the energy of the sun available for industrial purposes, it fascinated me early, but I must admit it was only long after I discovered the rotating magnetic field that it took a firm hold upon my mind. In assailing the problem I found two possible ways of solving it. Either power was to be developed on the spot by converting the energy of the sun's radiations or the energy of vast reservoirs was to be transmitted economically to any distance. Though there were other possible sources of economical power, only the two solutions mentioned offer the ideal feature of power being obtained without any consumption of material. After long thought I finally arrived at two solutions, but on the first of these, namely, that referring to the development of power in any locality from the sun's radiations, I can not dwell at present. The system of power transmission without wires, in the form in which I have described it recently, originated in this manner. Starting from the two facts that the earth was a conductor insulated in space, and that a body can not be charged without causing an equivalent displacement of electricity in the earth, I undertook to construct a machine suited for creating as large a displacement as possible of the earth's electricity.

This machine was simply to charge and discharge in rapid succession a body insulated in space, thus altering periodically the amount of electricity in the earth, and consequently the

pressure all over its surface. It was nothing but what in mechanics is a pump, forcing water from a large reservoir into a small one and back again. Primarily I contemplated only the sending of messages to great distances in this manner, and I described the scheme in detail, pointing out on that occasion the importance of ascertaining certain electrical conditions of the earth. The attractive feature of this plan was that the intensity of the signals should diminish very little with the distance, and, in fact, should not diminish at all, if it were not for certain losses occurring, chiefly in the atmosphere. As all my previous ideas, this one, too, received the treatment of Marsyas, but it forms, nevertheless, the basis of what is now known as "wireless telegraphy." This statement will bear rigorous examination, but it is not made with the intent of detracting from the merit of others. On the contrary, it is with great pleasure that I acknowledge the early work of Dr. Lodge, the brilliant experiments of Marconi, and of a later experimenter in this line, Dr. Slaby, of Berlin Now, this idea I extended to a system of power transmission, and I submitted it to Helmholtz on the occasion of his visit to this country. He unhesitatingly said that power could certainly be transmitted in this manner, but he doubted that I could ever produce an apparatus capable of creating the high pressures of a number of millions of volts, which were required to attack the problem with any chance of success, and that I could overcome the difficulties of insulation. Impossible as this problem seemed at first, I was fortunate to master it in a comparatively short time, and it was in perfecting this apparatus that I came to a turning point in the development of this idea. I, namely, at once observed that the air, which is a perfect insulator for currents produced by ordinary apparatus, was easily traversed by currents furnished by my improved machine, giving a tension of something like 2,500,000 volts. A further investigation in this direction led to another valuable fact; namely, that the conductivity of the air for these currents increased very rapidly with its degree of rarefaction, and at once the transmission of energy through the upper strata of the air, which, without such results as I have obtained, would be nothing more than a dream, became easily realizable. This appears all the more certain, as I found it quite practicable to transmit, under conditions such as exist in heights well explored, electrical energy in large amounts. I have thus overcome all the chief obstacles which originally stood in the way, and the success of my system now rests merely on engineering skill.

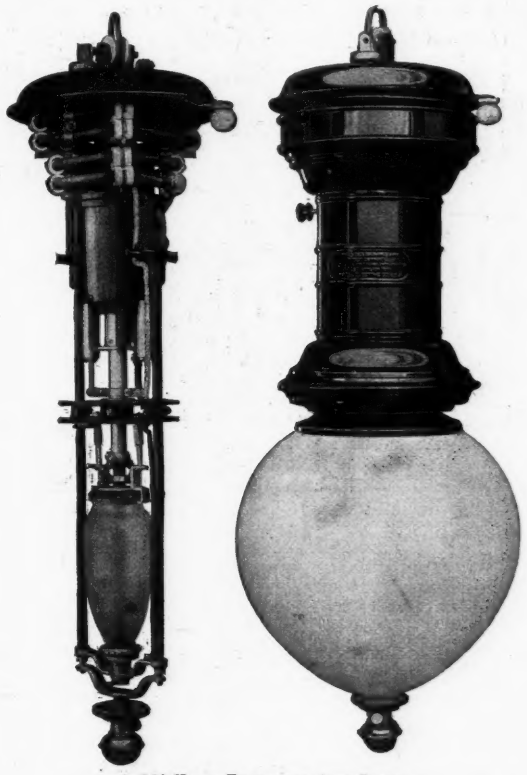
Referring to my latest invention, I wish to bring out a point which has been overlooked. I arrived, as has been stated, at the idea through entirely abstract speculations on the human organism, which I conceived to be a self-propelling machine, the motions of which are governed by impressions received through the eye. Endeavoring to construct a mechanical model resembling in its essential, material features the human body, I was led to combine a controlling device, or organ sensitive to certain waves, with a body provided with propelling and directing mechanism, and the rest naturally followed. Originally the idea interested me only from the scientific point of view, but soon I saw that I had made a departure which sooner or later must produce a profound change in things and conditions presently existing. I hope this change will be for the good only, for, if it were otherwise, I wish that I had never made the invention The future may or may not bear out my present convictions, but I can not refrain from saying that it is difficult for me to see at present how, with such a principle brought to great perfection, as it undoubtedly will be in the course of time, guns can maintain themselves as weapons. We shall be able, by availing ourselves of this advance, to send a projectile at much greater distance, it will not be limited in any way by weight or amount of explosive charge, we shall be able to submerge it at command, to arrest it in its flight, and call it back, and to send it out again and explode it at will, and, more than this, it will never make a miss, since all chance in this regard, if hitting the object of attack were at all required, is eliminated. But the chief feature of such a weapon is still to be told; namely, it may be made to respond only to a certain note or tune, it may be endowed with selective power. Directly such an arm is produced, it becomes almost impossible to meet it with a corresponding development. It is in this feature, perhaps, more than in its power of destruction, that its tendency to arrest the development of arms and to stop warfare will reside. With renewed thanks, I remain,

Very truly, yours,
N. TESLA.

New York, November 19.

220-Volt Enclosed Arc Lamp.

A perfected form of carbon feed arc lamp for direct connection across 220-volt mains, is being placed on the market by the General Electric Company. It operates with 120 volts at the arc, takes a normal current of 2.5 amperes, and, with one trimming, has a life of from 130 to 150 hours, requiring no attention during that time. These carbons are so proportioned that the upper carbon at the end of any run of 130 or 150 hours may be placed in the lower carbon-holder for the next run. The light is of less volume and more violet in color than standard 110-volt lamps, but the advantages of a 220-volt lamp, capable of independent operation, sometimes compensates for the diminution of light as compared with the General Electric five ampere-power circuit lamp for use, two in series, across 220-volt mains. A variable resistance at the top of the mechanism allows the use of the lamp on circuits of from 210 to 250 volts, and disconnection from the circuit is effected by a quick break-switch applied to each lamp.



A 220-VOLT ENCLOSED ARC LAMP.

The 220-volt lamp is weatherproof, and may be used without a hood. It is especially suitable for lighting vestibules, doorways, window fronts, etc. It may be used with the closed outside globe, as shown in the illustration herewith, or with the single globe and flared reflector. The casings are of several designs, the standard weatherproof casing being finished in black enamel.

An Important Lighting Consolidation.

A New York syndicate, headed by A. M. Young and R. A. C. Smith, have purchased the Norwalk Gaslight Company, Norwalk, Ct., the South Norwalk Electric Light Company, and the Greenwich, Ct., Gas and Electric Company; also the Gas Supply Company, of Fairfield County, Ct. These properties will be consolidated and operated under the charter of the Gas Supply Company. The authorized capital of the consolidated company will be $700,000.

New gasworks at Norwalk will be built at once, and the best and most modern appliances added to all the systems The consolidated plant, when finished, will be one of the finest in the state of Connecticut.

The offices of the company will be at South Norwalk, Ct., and at 100 Broadway, New York city.

Interesting Street Railway Decision.

The full bench of the Massachusetts Supreme Court decided on November 23 in a suit against the Warren, Brookfield & Spencer Street Railway Company that a landowner can not recover damages for injuries to property caused by the construction of an electric railway in front of it. The court holds that the statute giving damages is not applicable to electric street railways, but is intended to apply to companies organized for the production and sale of electric power or of electric light.

A Novel Telephone Catalogue.

The Victor Telephone Manufacturing Company, of Chicago, is sending out a novel catalogue. The covers are gummed at the outside edge, thus forming an envelope for the safe carriage of the pamphlet through the mails. One-half inch from the edge each cover is perforated, so that a strip may be torn off and the covers opened. It is a novel and neat idea. The catalogue itself contains information of value to every telephone manager, and may be had by any one interested in exchange work on application in writing.

SURFACE CONTACT ELECTRIC RAILWAYS.

(Continued from page 339.)

to justify its adoption wherever the overhead trolley is now financially successful.

Fig. 1 is a plan view of the switch box in its position in the roadbed, with the cover removed, so as to show the internal structure thereof (the line 2 2 being parallel with the roadway). Fig. 2 is a sectional view taken on the line 2 2, Fig. 1. Fig. 3 is a transverse sectional view taken on the line 3 3. Fig. 1. Fig. 4 is a vertical sectional view taken through the body of the switch-enclosing box on the line 4 4 of Fig. 5, which latter figure is, in turn, a horizontal sectional view of the same switch-enclosing box taken upon the line 5 5 of Fig. 4.

Referring to the drawings in detail, and first to Figs. 1, 2 and 3, B represents a cast-iron protecting box of rectangular form and provided with four legs, B^2 B^2 B^2, adapted to sustain the box in position between two ordinary cross ties T T. This box is cast in one piece, with an upwardly extending inner flange B′ running entirely around the interior of the box and adapted to form with the top or interior flange B^6 a deep-seated groove, which we may call a mud groove.

A represents the cover of the box, which is also of cast-iron, and is provided with two downwardly extending flanges A′ A^2, the flange A′ being adapted to extend a considerable distance into the mud groove, as will be seen on examination of Fig. 2.

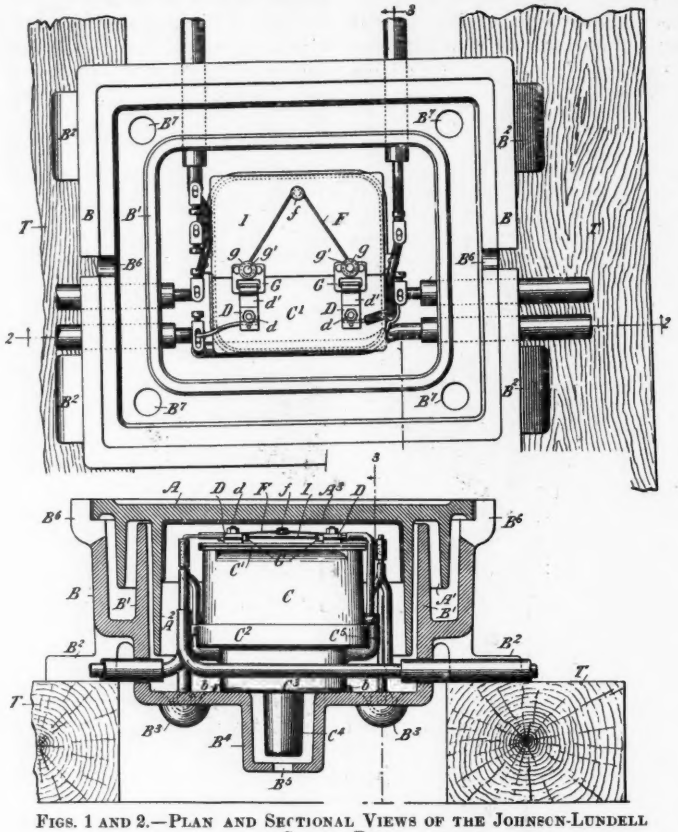
The flange A^2 is somewhat longer than A′ and extends to a point near the bottom of the box B, forming a sort of a dividing bell for the protection of the fuse block and terminals shown in the figures referred to.

The inner surface of the cover or lid A is lined with insulating material, for the purpose of preventing any possibility of the continuance of an arc when the fuse, which is shown in Fig. 1, blows.

The switch-enclosing box proper (see Figs. 4 and 5) is composed of two cup-shaped parts C and C^3, the lower part C^3 being provided with an upper grooved extension C^2 and a lower cylindrical extension C^4, the arrangement being such that the lower edge of the upper portion C of the enclosing box will fit within the grooved portion C^2. The lower portion C^3 constitutes not only a part of the enclosing box, but is also adapted to act mechanically as a part of the magnetic circuit of the electro-magnetic switch E′, being a cast or wrought-iron plate with an opening in its center and held by small screws *eee* to the upper face of the inner part of the grooved portion C^2.

The lower part C^3 of the enclosing box constitutes a chamber for the switch operating magnet, which is of solenoid form and is provided with two windings M and M′, the circuit connections for which will be described later.

N is a hollow solenoid core of soft iron secured to an insulating standard N′, which, in turn, is secured by a rod S^2 to a series of yielding conducting arms O O O, having secured to their outer ends a series of good metallic conductors O O O, the whole arrangement being such that when the solenoid core is in its lower position the metal contacts O O will rest on the upper surface of the insulating plate E.



FIGS. 1 AND 2.—PLAN AND SECTIONAL VIEWS OF THE JOHNSON-LUNDELL SWITCH BOX.

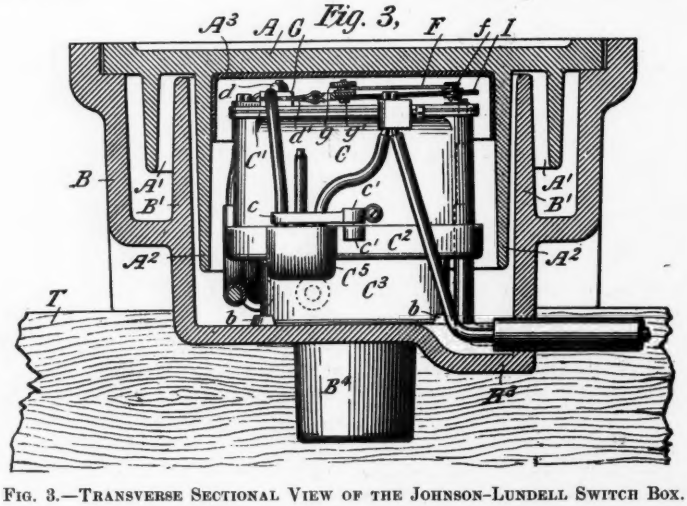


FIG. 3.—TRANSVERSE SECTIONAL VIEW OF THE JOHNSON-LUNDELL SWITCH BOX.

P^3 are blocks of insulating material, preferably slate, and P^2 are blocks of conducting material secured to the same.

P′ are clamps for holding beveled-shape blocks of carbon P P in position, the arrangement being such that when the solenoid core N is held in its upper position under the influence of an energizing current, the working current will pass from the conductor joining one of the carbon blocks P to and through the contacts O O O, arms O O and other contacts O O O to the remaining carbon block P, and thence to the exposed sectional trolley conductor imbedded in the roadbed in the manner well understood.

All of the parts of the switching mechanism are properly assembled in the workshop and placed in position in the enclosing switch box C.

The cables leading to the switch boxes and to the ends of the magnet coils are bent downward in the side box C^5, as shown, and the cover C is placed thereon, with its lower edge resting in the groove C^2, after which this groove is filled with paraffin or any preferred sealing material, thus assuring the fact that all of the operative parts of the switch will be protected at all times, and ready for use when they arrive at their destination, where they may be placed in the outer box B^4, after the manner shown in Fig. 2, and the necessary connections made between the several conducting cables.

This invention was the direct result of the frequent recurrence of a "live" section, consequent upon the leakage of current from the high-potential button to the low potential or switch button, resulting in the maintenance of the magnetic switch in a closed position, and a consequent "live" section after the car had passed, instead of allowing it to open and clearing the section, as it should.

By interposing the track rail, i. e., the negative conductor, between these two buttons, electric connection between them was made absolutely impossible, except through the motor, hence a switch magnet could only be energized by the motor current—which is, of course, interrupted by the passing of the car—and never by the leakage current which, being independent of the car, remains as a source of evil. The importance of this provision against accidental electrification of the street, as well as its efficacy as a remedy, is acquiesced in by every one who has thus far considered the subject.

The accompanying diagram will fully illustrate the manner in which the leakage currents are effectively guarded against. Upon examination of this diagram it will be noted that the magnet operating coils are contained in a circuit leading from the track rails to sectional rails placed outside of the same. As the current which energizes the magnets travels in a direction from the sectional rails to the track rails, it follows that any leakage from the sectional service conductors SC1, SC^3, SC^5, etc., could never reach the outside sectional rails and cause a current to flow from said sectional rails to the track rails by way of the coils, all the leakage current necessarily being absorbed before it passes the negative track rails.

(To be continued.)

The Pennsylvania Manufacturing Company has secured control of seven electric lighting plants located in Pennsylvania, New Jersey and New York, with an aggregate capital of $2,000,000. These plants have been bought, and will be paid for, by the Pennsylvania company, it is said, without calling upon the stockholders for $1 of additional capital and without increasing fixed charges.

A Unique Catalogue.

The general catalogue, known as No. 14, issued by the Western Electrical Supply Company, St. Louis, Mo., is one of the most comprehensive volumes of this character ever issued in the electrical field. To those who have any business or active connection, and to those who desire to keep intelligent as to the development of matters electric, it must be of great value. The book is equal in size to a large library volume, and embraces descriptions of all the appurtenances pertaining to electric lighting, house goods, telephones, electric railway and much special electrical apparatus.

In the preparation of the catalogue it evidently has been the aim of the Western Electrical Supply Company to give more than a price list and selling description by making the text in each case of a practical nature, filled with suggestions as to the proper selection, adaptation, and operation. As an illustration, the Adams-Bagnall arc lamps, for which they are agents, are illustrated in detail; accompanying is a well prepared article which any arc lamp expert might read with benefit. Instructions are given for unpacking and adjusting, the proper adjustment of dynamos for arc lighting, carbons, trimming and general care of arc lamps for the best results. It is the custom of this company also to send monthly bulletin sheets noting any changes in prices or goods. These bulletins are so cut that they may be inserted in the volume and thus the holder of the catalogue has the ruling prices for standard goods always before him.

A Great Electrical Combine in Germany.

According to advices from Berlin one of the greatest transactions in the entire economic history of Germany, and certainly the most important in the development of the electrical industry, is the consolidation of the Schuckert Electric Company, of Nuremburg, with the Ludwig-Loewe Company, of Berlin, and the Continental Company, of Nuremburg, with the Berlin Company for Electrical Undertakings. The Loewe and Schuckert companies organized the other corporations for the purpose of financing their electrical ventures and the Loewe company confines itself to the manufacture of electrical machinery and machine tools upon electrical models. The two amalgamations are really one company, with a capital of £4,500,000, and a bonded debt of £1,000,000.

A New Arc-Lamp Catalogue.

"Enclosed Arc Lamps" is the title of the latest pamphlet issued from the General Electric press. It deals with the different types of enclosed arc lamps manufactured by the General Electric Company for direct and alternating-current circuits, indoor and outdoor lamps, marine lamps, miniature lamps, power-circuit lamps, series enclosed lamps and single-globe and double globe lamps. Each type is well illustrated, and the object of its design and its advantages set forth in language unhampered by abstruse technical expressions. It is written for the information of the general consumer as well as the electrician. Printing and illustrations are, as usual, excellent. The pamphlet will be sent to persons interested on application to any of the sales offices of the General Electric Company.

The Iowa Telephone Company has commenced the $60,000 improvement in its Sioux City, Iowa, exchange.

Telephone News .....and Comment

The New Rochelle & West Chester Telephone Company was incorporated at Albany, N. Y., on November 23, with a capital of $150,000, to maintain lines of telegraph and telephone in New Rochelle, and thence to Mamaroneck, Bridgeport, New Haven, Boston, Providence, White Plains, Yonkers, Albany, Buffalo, Ogdensburg, Rouse's Point and other cities, villages and towns in the states of New York, Connecticut, Massachusetts and Rhode Island. The directors are George W. Sutton and Joseph Claudet, of New Rochelle; Heinrich Meyer, of New York city, John H. Scofield and David G. Whiting, of Grand View, and Horace A. Connor and Frederick R. Kellogg, of Brooklyn.

President Charles J. Glidden, of the Southwestern Telephone and Telegraph Company, accompanied by Mrs. Glidden, has been spending a few weeks in Texas and will soon return to his home in Lowell, Mass.

The year 1898 has developed greater activity in the telephone world than any since the invention of the instrument. Thirty-three states are now connected by long-distance systems, and it is confidently predicted that before the close of the century persons on the Pacific coast will be talking by telephone to persons on the Atlantic seaboard. Ring off, please.—*Buffalo, N. Y., Courier.*

The Electrical Workers' Union and the New Telephone Company, of Indianapolis, Ind., have signed an agreement providing for a nine-hour day and a price and one-half for overwork.

The Missouri & Kansas Telephone Company is making arrangements to construct a long-distance telephone from Hannibal to St. Joseph, Mo.

A Denver newspaper heads a story describing the local telephone exchange as follows: "Girls with nimble fingers and keen brains juggle with lightning juice."

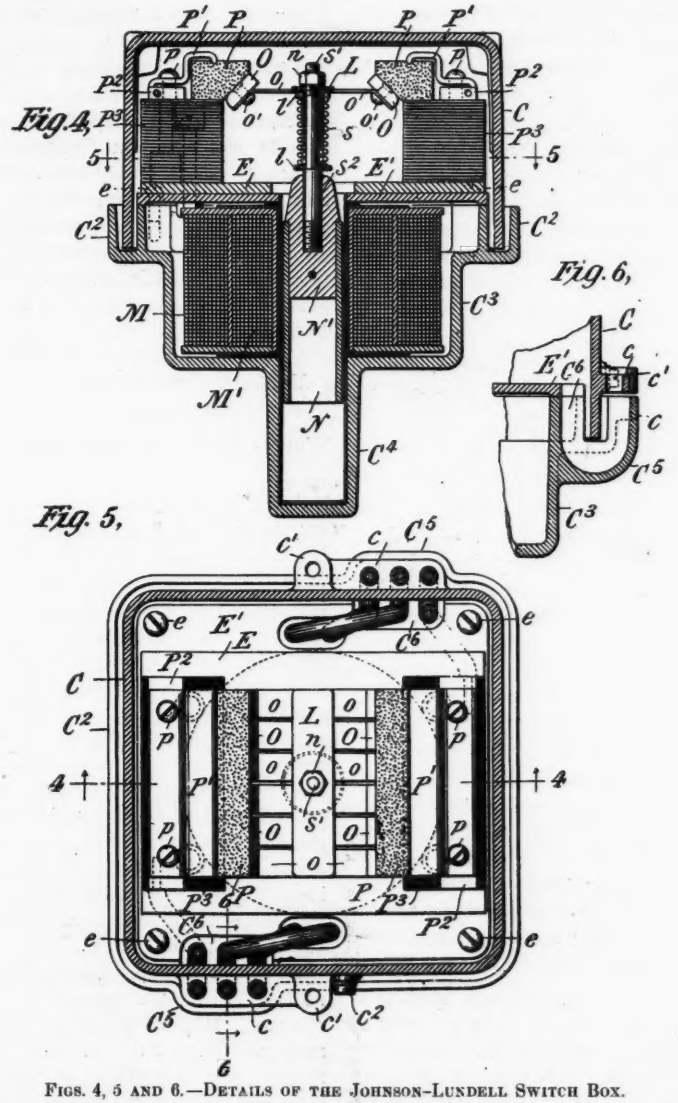
A report from St. Louis is to the effect that by December 1 the Kinloch Telephone Company, of that city, will have 750 instruments in operation. Each week thereafter 500 instruments will be added to the list until the entire 4,500 instruments now contracted for and connected are in use.

The Missouri & Kansas Telephone Company is installing $20,000 worth of new underground conduit in Kansas City, Mo.

The Interstate Telephone Company, of Cleveland, Ohio, has been incorporated by J. A. Rutherford, Scott R. Hayes, C. B. Arthur, R. M. Fuller and O. C. Evans. They propose to construct and operate a line from Cleveland to Cincinnati, with branches. The capital stock is $25,000.

The school-teachers of Colorado Springs, Colo., want telephone connection between all the large school buildings.

The ELECTRICAL REVIEW is informed by a correspondent that the Hattiesburg, Miss., Telephone Company wants to buy some galvanized iron wire, and also that the manager wants to employ a good, all-around telephone man.



FIGS. 4, 5 AND 6.—DETAILS OF THE JOHNSON-LUNDELL SWITCH BOX.

OUR CANADIAN LETTER.

HULL, QUE.—Tenders for lighting the city by electricity will shortly be invited.

SEAFORTH, ONT.—It is understood that a company is being formed to operate a telephone exchange here.

ST. THOMAS, ONT.—It is probable that the St. Thomas Street Railway will be extended to Port Stanley. J. H. Still is president.

HAMILTON, ONT.—The Hamilton Radial Railway Company has decided to extend its line to Port Nelson. Work will commence immediately, it is said.

VICTORIA, B. C.—The Electric Light Committee have recommended that the city invite tenders for 12 arc lamps and one-half mile of electric wire.

OTTAWA, ONT.—The Deschenes Electric Company will, it is said, make another application to the city for a franchise for electric lighting and power.

CORNWALL, ONT.—It is understood that some improvements will be made to the system of the Cornwall Electric Railway Company, of which Mr. D. A. Starr is manager.

TORONTO, ONT.—The Toronto Electric Light Company and the Metropolitan Railway have submitted tenders for the electric lighting of the town of Deer Park.

BEETON, ONT.—The contract for an electric light plant for the town having been awarded, steps will be taken at once to erect a power-house and purchase an engine and boiler.

LEVIS, QUE.—At the next council meeting the question of introducing waterworks and electric light systems into the town will be discussed. The project, if carried out, will cost from $200,000 to $300,000.

HAMILTON, ONT.—The promoters of the Hamilton, Chedoke & Ancaster Electric Railway has made a new proposition to the City Council, which was accepted. It is hoped that now it will be possible to finance the project.

HAMILTON, ONT.—Mr. Percy Domville has been instructed by the Special Electric Light Committee to prepare an estimate of the cost of an electric lighting plant of 300 arc and 3,000 incandescent lights' capacity.

INGERSOLL, ONT. — The Town Council have appointed a committee to negotiate for the purchase of the waterworks and electric light plant, and to arrange for the construction of a trunk or main sewer on Thames street.

SARNIA, ONT.—A meeting of the railway committee of the Town Council will be held shortly, to confer with the representatives of the Lambton Central Railway and the Sarnia Street Railway relative to the proposed electric suburban road.

TORONTO, ONT. — The Toronto Street Railway is considering a scheme for a system of radial railways extending throughout the province, with Toronto as headquarters. The company have not yet, we learn, reached any decision in the matter.

LONDON, ONT.—The People's Telephone Company, according to report, intend to install a plant here at once. They will purchase their supplies from the Stromberg-Carlson Manufacturing Company, of Chicago, who will likely start a factory in this city.

ST. THOMAS, ONT.—It is understood to be the intention of Mr. J. H. Still to immediately rebuild his handle factory. It is probable that the pipe foundry will be rebuilt. The People's and the Bell companies have each been asked to submit new propositions for a new telephone franchise.

NORTH SYDNEY, N. B.—Mr. J. A. Young, of the Sydney Gas and Electric Company, has floated the Glace Bay Electric Light and Power Company for the purpose of supplying electric light to the village of Glace Bay. The power-house will be located at the abandoned Stirling pit.

VICTORIA, B. C.—On behalf of a Victoria syndicate, W. Goodacre and L. Jenson give notice of application for incorporation of the Hardy Tramway Company, to build a tramway from Hardy Bay to Cold Bay, Quatsino Sound, a distance of eight miles. It is probable that electricity will be the motive power.

RIDGETOWN, ONT.—A meeting of gentlemen interested in securing an electric railway between Thamesville, Bridgetown and Rondeau Park was held here last week, at which it was decided to apply for a charter as soon as the necessary funds could be procured. Among those present were R. Ferguson, M. P. P., and W. E. Cundy, barrister.

HULL, QUE.—The question of extending the Hull & Aylmer Electric Railway to Gatineau Point is under the consideration of the directors of the company. It is the intention to commence the construction next Spring. At the last meeting of the City Council it was decided to call for tenders at once for the lighting of the city by electricity.

THREE RIVERS, QUE.—In connection with the waterworks of the Shawenegan Falls on the St. Maurice River, the contract for hydraulic works has been let to Messrs. Barry, Ross & McRae, of Niagara Falls, Ont. It is probable that the scheme will include the construction of an electric railway from Shawenegan Falls to this place, a distance of 19 miles.

QUEBEC, QUE.—The official announcement was made by the Quebec, Montmorency & Charlevoix Railway Company that it is proposed to electrify the road running to Cap Tourmento and to construct an independent branch to Montmorency Falls. The estimated cost of improvements is given as $330,000, and, when completed, the system will comprise over 60 miles of electric railway. The president of the company is H. J. Beemer.

J. A. C.

Montreal, November 23.

Water-Power in Switzerland in 1897.

According to a London contemporary, the French journal, *L'Electricien*, has recently published some figures upon this subject, and below is a summary of the more important ones appearing in that paper During 1897, 35 new projects received the sanction of the authorities, and five extensions of existing installations were also approved. Of the 35 new schemes, 17 were lighting schemes, four were transmission schemes, and 14 were combined lighting and transmission schemes. Continuous current was to be used for 14 lighting installations, one transmission scheme, and seven of the combined lighting and transmission plants. The triphase system was to be used in connection with the remaining 13 schemes. Most of the schemes were small, and support the statement that shortly every little village in Switzerland will be lighted and supplied with power for its smaller industries by electricity developed from water-power in the vicinity. The total power of the 35 new schemes is made up as follows:

			KILOWATTS
27 installations	under 100	kilowatts	925
6 "	100—500	"	1,324
2 "	over 500	"	2,740
Total			4,989

This total is 1,758 kilowatts less than that of the preceding year. The decrease is explained by the fact that all the larger and more easily developed waterfalls have already been exploited.

ELECTRIC RAILWAY NOTES.

The West Chicago Street Railway Company recently declared a quarterly dividend of one and one-half per cent, payable November 15.

The Big Four Railway Company have decided to erect their own electric light plant at Bellefontaine, Ohio, for lighting shops, depots, yards, tracks, etc.

The electric railroad from Hartford City, Ind., through Alexandria, Frankton, Perkinsville, Noblesville and as far south as Indianapolis, is to be built at a cost of $1,000,000.

At the annual meeting of the stockholders of the Barre & Montpelier, Vt., Traction Company officers as follows were elected: F. C. Kennedy, J. J. Flynn, A. O. Humphrey, Burlington; W. B. Ferguson, Boston; C. A. Richardson, Worcester; D. N. Miles, F. G. Howland and H. K. Bush, Barre, and T. J. Deavitt, of Barre, all stockholders, were elected a board of directors. The directors elected F. C. Kennedy, president; J. J. Flynn, vice-president, and George A. Putnam, Boston, treasurer; F. G. Howland, assistant treasurer, and H. K. Bush, clerk.

Papers consolidating the North End Street Railway Company, the Fort George & Eleventh Avenue Railroad Company and the Fort George Extension Railway Company, under the name of the Fort George & Eleventh Avenue Railroad Company, of New York city, have been filed with the Secretary of State. The new company has a capital of $3,000,000, and its directors are John T. Little, Jr., Ambrose F. McCabe, Fred C. Garrick, Frank F. Ogsten and Sharon Graham, of New York city; Clement M. Cumming, Yonkers; C. A. Gilbert, of White Plains; W. A. Dibbs, of Brooklyn; D. C. Moorhead, of Jamaica.

At the annual elections of the Buffalo, N. Y., Railway Company and the Buffalo Crosstown Street Railway Company the former company elected these officers and directors: Henry M. Watson, president; H. H. Littell, vice-president and general manager; Joseph S. Baecher, secretary and treasurer; H. Sellers McKee, T. Dewitt Cuyler, Samuel S. Spaulding, Robert L. Fryer, George Urban, Jr., Daniel O'Day, John N. Scatcherd, James B. Speed and Pascal P. Pratt, directors. The Crosstown company elected the following officers: H. H. Littell, president and general manager; Robert L. Fryer, vice-president; Joseph S. Baecher, secretary and treasurer; H. Sellers McKee, C. C. Cuyler, S. S. Spaulding, H. W. Box and J. M. Brinker, directors.

FOREIGN ELECTRICAL NEWS.

Electricity as a Cure for Rheumatism—At the medical congress, held at Liége in September last, Dr. Linderman, of Hamburg, delivered an address to the members, on "The New Application of Electricity as a Cure for Rheumatic Pains." The doctor, who is learned in therapeutics, utilizes electrical heat in the apparatus which he has invented. This apparatus secures the production of an entirely dry heat, the caloric power of which can attain from 50 to 150 degrees centigrade, without the patient being in any way incommoded. The epidermis, it has long been known, is capable of supporting a very high temperature, provided this temperature is dry. The doctor made two experiments before the congress at Liége, one being carried out on the person of a girl who had suffered for some time with articular rheumatism of the right hand. The second test was performed on a man of 30, who was also troubled with rheumatism in the hand. Both patients were unable, previous to the experiments of the doctor, to use their hands in any way, those members being completely rigid and incapable of muscular movement. The hands were placed in an air chamber, where they were subjected to an increase in temperature of from 90 to 120 degrees, on attaining which they were at once able to perform any action required of them. This, however, was only as long as they remained in the chamber, for as soon as the current was removed a change was immediately apparent, the hands returning to their previous state of paralysis. With the current turned on again they were at once restored to life. By means of this apparatus, Dr. Linderman has been able to effect a considerable number of cures, the maximum treatment for each case requiring from 10 to 12 applications of the electrical bath.

The Aron Meter—A company of considerable importance (says the English correspondent of *L'Industrie Electrique*) is about to be formed in England to undertake the construction and sale of the "Aron Meter," well known, not only in England, but also throughout the Continent and the United States. The original patent for this meter expired in April last, and the new patents, of which the present company are the sole owners, were taken out at the same time that the old one expired. These patents cover the present form of the meter, which is automatic, and much more compact than it was when first placed on the market. The directors of the company just formed include some of the most prominent names in the electrical world, Dr. Aron himself being vice president of the company. The capital will be $1,300,000, three-fourths, at least, of which have already been offered to the general public.

Electricity from the Peat-bogs of Germany—In an article published in *Stahl und Eisen*, the author, Dr. Frank, proposes the transformation of the immense peat-bogs of northern Germany into central stations for the production of electricity on a large scale. He estimates that two acres of these bogs would produce 2,500 tons of dry heat, which would be equivalent to 1,200 tons of coal. The peat-bogs in the valley of Ems, which have a superficial area of 2,600 kilometers, would then be able to furnish 650,000,000 tons, or an equivalent of 300,000,000 tons of coal, as much as is now produced in Germany in three years; the average annual output of coal in this country being 80,000,000 tons. To avoid the expense of transportation, which would be enormous, central stations could be erected on the spot, the capacity of the station being about 10,000 horse-power, and consuming 200,000 tons of peat per annum, the output of 160 acres. The power thus generated into electricity could be employed in various ways, and would be especially useful in connection with the new canal now in course of excavation between Dortmund and Ems and shortly to be completed. The writer is of the opinion, however, that the most interesting use to which the electricity would be applied would be the production of acetylene, the necessary elements for which can be easily obtained in the neighborhood and at very little cost.

Mrs. Hopkinson's Gift to the University of Cambridge—Mrs. John Hopkinson, her eldest son and her only surviving daughter, have presented to the University of Cambridge the sum of $60,000, for the erection of a new addition to the laboratory at Cambridge, in memory of her husband, Dr. John Hopkinson, and her son, John Gustave Hopkinson, whose tragic deaths were recently reported. Dr. John Gustave Hopkinson was to have entered as a student of these laboratories in October last. The gift will be appreciated at the university, where the professors in charge of the laboratories have been sadly in need of room. The doctor left a fortune of $500,000.

Exposed Electrical Incandescence—An important discovery, which will shortly revolutionize lighting by electricity, has just been made. This is incandescence in air. The patents covering this invention have been taken out, in various countries, by the firm of Ganz, of Budapest, who are now actively engaged in perfecting this new mode of lighting. An aluminum tube, three-twelfths of a millimeter, receives the current through two small platinum wires, the tube becoming effulgent on the passage of the current. No glass bulbs are needed, and the light, it is claimed, is much more effulgent, while the cost of manufacture is appreciably less. Aluminum tubes have undergone incandescence during a period of 700 hours, without showing any physical or chemical changes. The only difficulty was that aluminum is not a conductor of current in its cold state. The difficulty has, however, been overcome by the heating of the tube, which is run automatically. A small coil of platinum wire is brought into touch with the aluminum tube, and as soon as the current passes, this coil immediately becoming heated, communicates its warmth to the tube, from which it is released automatically. It seems, from the experiments which have been made so far, that the new system is absolutely satisfactory.—*L'Electricien.*

ELECTRIC LIGHT FLASHES.

The People's Electric Light Company, of Flint, Mich., will increase its capacity from 3,000 to 8,000 lights. The new improvements will cost $25,000.

The earnings of the Edison Electric Illuminating Company of New York for October were as follows:

	1898.	1897.	Increase.
Gross.....	$253,897 91	$214,580.60	$39,317.31
Net	100,800.10	91,398.65	9,400.45
Gross, 10 months....	2,424,661.41	1,958,335.12	466,326.29
Net 10 months	1,009,185.85	857,253.88	151,931.97

The Lowville, N. Y., Electric Light and Power Company has transferred the capital stock and all its personal property to the new Wetmore Electric Company for $18,000 cash. The new company will assume all contracts held by the old company. George W. Pulver, of Syracuse, is president of the new company.

The plant and franchise of the Newton, Kas., Light and Power Company has been purchased by a company which will be known as the Gas and Electric Company, of Newton. The officers are: Don Kinney, president; John C. Nicholson, vice-president and treasurer; James D. Nicholson, secretary. The plant will be improved and enlarged.

At the annual meeting of the West Superior, Wis., Water, Light and Power Company officers were re-elected as follows: W. R. Merriam, of St. Paul, president; V. M. Watkins, of St. Paul, vice-president and treasurer; W. H. Winslow, of Superior, secretary. A. A. Cross was re-elected general manager. The new board of directors is: W. R. Merriam, Frank A. Ross, R. R. Dunn, Charles B. Dunn, V. M. Watkins, W. H. Winslow, and Kenneth Clark.

The Cincinnati, Ohio, Gas Company has called for a meeting of the stockholders December 21, to authorize an increase in the capital stock from $8,500,000 to $9,000,000. The money is needed for extensions and buildings which the company has been making for the past few years. A rumor is current again that the Cincinnati Edison Electric Company, the stock of which is ostensibly held in the East and by the General Electric Company, has passed to the Cincinnati Gas Company.

Prizes Awarded for Naming an Incandescent Lamp.

Some time since the Warren Electric and Specialty Company, manufacturers of incandescent lamps, Warren, Ohio, organized a contest for a choice of name for their new lamp. The judges have just rendered their decision, and the following is a list of those persons who were awarded prizes:

First prize, $50—"Peerless." Joe E. Calloway, Pueblo, Colo.; Jno. C. Watson, Charlotte, N. C.; J. W. Freeman, Joplin, Mo.

Second prize, $30—"Wesco." K. W. Mansfield, South Norwalk, Ct.; Gugler Electric Company, Minneapolis, Minn.; J. E. Calloway, Pueblo, Colo.; H. P. Ayer, Portland, Me.; J. S. Daily, Chillicothe, Ill.; New Orleans Electric Company, New Orleans, La.; C. J. Wetsel, Chicopee Falls, Mass.

Third prize, $20—"Liberty." W. H. Schott, Chicago, Ill.; Joe E. Calloway, Pueblo, Colo.; A. D. Scatcherd, Batavia, N. Y.; Chas. Frankish, Ontario, Cal.; Phillip Hickley, Chicago, Ill.

Fourth prize, $10—"Aladdin," "Aurora," "Eclipse," "Encore." Thos. Day Company, San Francisco, Cal.; D. A. Gill, Kansas City, Mo.; Lemuel K. Cushing, Chicago, Ill.; H. L. Brintnall, Saginaw E. S., Mich.

ADVANCE INFORMATION

New Incorporations.

PIERRE, IOWA—The Chemical Battery Light, Heat and Power Company has been incorporated, with a capital of $5,000,000; incorporators, Frank W. Lowery, E. O. L. Apel and E. L. Squire.

BRYAN, OHIO—The Williams Toll-Line Company, to operate telephone lines, has been incorporated, with a capital stock of $30,000.

Increase of Capital.

UTICA, N. Y.—The Bossert Electric Construction Company have increased their capital stock from $16,000 to $75,000.

New Telephone and Telegraph Companies.

COLUMBUS, IND.—The Citizens' Telephone Company, of this city, and the Indianapolis Long-Distance Telephone Company have entered into a contract to build a telephone line from this city to Nashville, Brown County. The work will be completed by next April.

CARTER CITY, KY.—A telephone line will be built from this place to Vanceburg. J. F. Lewis and Dr. E. H. Robbins are interested.

PLATTSBURG, N. Y.—The Northern New York Telephone Company have completed their line connecting this place with Port Henry, via Bluff Point, Valcour, Port Kent, Keeseville, Clintonville, Ausable Forks, Wilmington, Black Brook, Upper Jay, Lower Jay, Keene, Elizabethtown and Westport.

CONTOOCOOK, N. H.—A new telephone line has been put up between this place and Winnepocket farm in Webster. One will also be put up between this place and Hopkinton.

CEDARVILLE, N. Y.—L. T. Carver is building a telephone line from this place to Cedar Lake, a distance of 12 miles. The line will comprise 20 telephones.

TOLEDO, OHIO — The Montpelier Telephone Company has been organized, with J. S. Brailey manager. A local exchange will be operated in a month.

MANCHESTER, OHIO — The Ohio Telephone Company has asked the Common Council for a franchise to construct an exchange in this village.

OPELIKA, ALA. — The new telephone line between Opelika and LaFayette has been completed.

AURORA, ARK. — The telephone line from this place to Pettigrew is in course of erection.

NEW BEDFORD, MASS.—The Automatic Telephone Company has been incorporated; capitalized at $100,000; the officers are as follows: President, John W. Macomber; vice-president, Francis T. Akin; treasurer, Frederick Taber; clerk, Arthur E. Perry.

EARLVILLE, N. Y.—A project is on foot for a local telephone line running from the Ontario & Western and West Shore depots to the Delaware, Lackawanna & Western Railroad, connecting with the different business places, factories, banks and hotels.

TRENTON, N. J.—The Bell Telephone Company has completed its lines between this place and Lambertville.

SNOW HILL, MD.—The Worcester County Telephone Company has succeeded in securing the entire capital stock, and the line will be built immediately. The directors are Dr. George W. Bishop, Clayton J. Purnell, John P. Moore, Thomas M. Purnell, John W. Staton, J. Edward White, O. M. Purnell, O. D. Collins and W. S. Powell.

IOLA, KAS.—The M. & K. Telephone Company are extending their line south from Ottawa to Garnett. From there they will run south to Galena and other points.

WEST GROVE, MD.—The Delaware & Atlantic Telephone Company is putting up a new line from this place to Oxford.

GERMANTOWN, KY.—J. F. Walton, T. M. Dora and others have chartered the Germantown, Minerva & Maysville Telephone Company to establish telephone lines.

SUFFOLK, VA.—The Isle of Wight Telephone and Telegraph Company has been chartered here to establish a telephone line between Suffolk and Smithfield. Address W. N. McAnge, general manager.

CLEVELAND, OHIO—The Interstate Telephone Company has been incorporated; capital, $25,000.

EVANSVILLE, WIS.—The Evansville Telephone Company, recently organized by a number of resident business men, has elected the following officers: President, Allen S. Baker; vice-president, A. C. Gray; secretary, R. M. Richmond; treasurer, Geo. L. Pullen. The contract for putting in the complete system has been awarded to Jones & Winters, of St. Paul, who are to have the exchange in complete working order by January 1, 1899.

SIOUX CITY, IOWA—A contract for an independent telephone line between Sioux City and Des Moines has been closed by the Home Company, of this place.

Electric Light and Power.

SEA BRIGHT, N. J. — The Sea Bright Electric Light Company will rebuild its plant which was destroyed by fire several weeks ago.

NEW HOLLAND, PA.—The question of putting in an electric light plant at this place is being agitated. Mr. Eli Martin is interested.

HOUTZDALE, PA.—S. T. Henderson has completed his arrangements for the erection of an electric light plant at Mill Hill.

RICHMOND, KY.—Messrs. Frank Adair and D. J. Hauss, Cincinnati electricians, are here negotiating with the city for privileges of putting in an electric street-car plant.

GADESDEN, ALA.—The Alabama Light and Power Company will build a power plant to cost $25,000, to furnish electric-railway power, etc.

KISSIMMEE, FLA.—J. M. Bailey is interested in the proposed construction of electric light plant.

MONROE, LA.—The Mayor may be addressed for information concerning proposed construction of electric light plant, for which bonds will be issued.

THIBODEAUX, LA.—The Mayor may give information concerning establishment of electric light plant.

MACON, MO.—The Trans-Mississippi Electric Light and Power Company has been incorporated by Col. F. W. Blees, J. F. Schaefer and Charles E. Roel, for the purpose of establishing and managing electric light and power stations; capital stock, $30,000.

CARO, MICH.—Caro Light and Power Company has been incorporated, with a capital stock of $25,000.

ATHENS, N. Y.—The Athens Electric Light and Power Company has been incorporated; capital, $20,000; directors, Jeremiah M. Shuman, of Newburgh, and four others.

New Electric Railways.

BURLINGTON, VT. — An electric railway is to be constructed between this place and Hinesburg. It will be 15 miles long and will cost $140,000. It will be used both for freight and passenger traffic. Work has already begun.

LANSDALE, PA.—A plan is on foot to connect Daylestown with the upper end of Bucks County by means of a trolley road from the county seat to Perkasie, Sellersville and Quakertown. At the latter place it is proposed to connect with the Quakertown and Richlandtown trolley.

CORUNNA, MICH.—The City Council has granted a 30-year franchise to W. E. Avery, of Detroit, and F. J. Northway, of Durand, co-partners doing business under the firm name of the Long Lake, Durand & Corunna Street Railway Company, giving them the privilege to build a street railway through this city.

GARFIELD, N. J.—The Sandford & Stillman Company, of Jersey City, has been awarded the contract for building the trolley line from this place to Lodi.

NILES, MICH.—The City Council has granted the Michigan-Indiana Street Railway Company a 30-year franchise to operate, maintain, etc., a street-line system. The line is to run from South Bend to Benton Harbor, through Niles and Berrien Springs.

CHARLESTON, ILL.—The Charleston & Mattoon Electric Railroad Company has been incorporated, to operate electric, horse or dummy railroad in Cole County; incorporators, Forbes Holton, M. R. Williams, W. W. Patton; capital, $125,000.

AMESBURY, MASS.—The contract for building the Hampton & Amesbury Street Railway has been awarded to Soule, Dillingham & Company, Boston, who will immediately begin its construction.

OWOSSO, MICH.—The Long Lake, Durand & Corunna Street Railway Company has secured franchises from Holly to the Corunna line, three miles east of this city. W. E. Avery, of Detroit, and F. J. Northway, of Durand, are the prime movers in the project. With them are associated J. W. Winters and Dr. Sau, of Detroit, with others. The Owosso & Corunna Traction Company's line from Corunna to this place will be amalgamated with the new line. At Pontiac the new line will join with the Detroit & Pontiac Interurban Road.

A PERFECT LAMP.

Some time ago the Fostoria Incandescent Lamp Co., of Fostoria, Ohio, sent me a sample of their Duplex double filament switch lamp. I tested the same thoroughly, found the vacuum of the highest degree, brilliant white light and long life; am really charmed with its workings.

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We also wish to notify you that a change in the organization has taken place, and hereafter the Company will be managed by E. RUEBEL, Secretary, and CHAS. E. SHARP, Treasurer. MR. SHARP has been Manager of the Southern Electrical Supply Company for several years, and MR. RUEBEL has for many years been President of the St. Louis Electrical Supply Company, and during the past few months has been engaged in manufacturing the well known Ruebel Telephone at 917 and 919 Market Street, under the name of E. Ruebel & Co. Hereafter these telephones will be manufactured under the name of the Southern Electrical Supply Company at our new place, where one floor of the building has been set aside for this department.

We will also represent several high-grade specialties, and continue to be the exclusive agents for the products of the well known Okonite Company, and trust that the friends of the Southern Electrical Supply Company and of E. Ruebel & Co. will continue to patronize us at our new place.

Yours respectfully,
E. RUEBEL, Secretary.
CHAS. E. SHARP, Treasurer.

St. Louis, Mo., November 1, 1898.

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[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED NOVEMBER 22, 1898.

614,453 Method of manufacturing electric cables; S. Z de Ferranti, Hollinwood, Eng.—Consists in first forming a circular stranded conductor, compressing said conductor to the shape of a part of a circle in cross-section, insulating said conductor, and, lastly, laying a number of such conductors together forming an approximately cylindrical cable.

614,462 Commutator; J. R Grindrod, Lynn, Mass.—Composed of a number of segments separated from each other by insulation, and provided with means whereby they may be secured to the shell, a finished or partly finished outer periphery for making contact with brushes and means for securing the segments in place during transit and mounting, but which is removed before the commutator is used.

614,472 A potential switch; J. D. Ihlder, Yonkers, N. Y.—A potential switch, the coils of which are wound in opposition, having an adjustable core-piece.

614,484 Hanger for electric lamps; J. E. Mayo, Belvidere, Ill.

614,492 Word register for typewriting machines; E. McHugh, Dublin, Ireland.

614,494 Fire and burglar alarm; J. L. Norris, Washington, D. C.

614,528 Electric lighting gas-burner; J. M. Anck, Philadelphia, Pa.

614,539 Secondary battery; N. H. Edgerton, Philadelphia, Pa.—Has a series of superposed plates, each consisting of a zinc element, a coating of lead applied thereto, said lead having a layer of red lead superimposed thereupon and granulated nonconducting charcoal supported upon said red lead.

614,571 Transformer system and apparatus; A. Muller, Hagen, Germany—Consists of two circuits for carrying currents of different tension, a commutator interposed therein, storage cells in the high-tension circuit electrically connected in groups with said commutator and adapted to be charged in parallel and discharged in series when receiving current from, and charged in series and discharged in parallel when supplying current to, the commutator; and a storage battery always in circuit with the low-tension circuit and connected with the commutator.

614,575 Conduit and electric-current conductor for surface railways; A. Petzenburger, Gross Lichterfelde, Germany.

614,608 Dynamo-electric machine or electro-motor; E. Cantono, Pavie, Italy—A dynamo-electric machine constructed with the fixed and rotative members of its magnetic field movable toward or from each other to vary the air space, and with an elastic medium tending to widen said air space, so that the width of said space varies with the field excitation.

614,633 Electrolytic apparatus; F. A. Thum, Newark, N. J.

614,677 Switchboard apparatus, signal and circuit; T. C. Wales, Jr., Boston, Mass.

614,686 Magnetic cutout; L. Andrews, Hastings, Eng.—Consists of a core surrounded by a continuous winding in series with the generator, a shunt-winding part of which is in the same direction as the series winding and the other part in the reverse direction, and a switch controlled by said core.

614,709 Means for driving railway, tramway or automobile cars; G. Dupont, Paris, France.

614,759 Galvanic battery; C. T. Richmond, Cleveland, Ohio.

614,794 Circuit-breaker; W. I. Crawford, St. Louis, Mo.—An armature, a vertical stem whereby the armature is suspended, a standard to which the stem of the armature is secured, so as to swing from its upper end, and an adjustable clamp for connecting the stem of the armature to the standard between the head of the armature and the point where it is secured to the standard.

INDUSTRIAL NOTES.

The Wm. Inglis Wire and Iron Works, Detroit, Mich., make special wire lamp guards for incandescent bulbs, and other wire goods of special designs as they may be needed for electrical adaptation.

The foreign business of the Westinghouse Electric and Manufacturing Company is said to be now larger than it has been in the history of that company, and at the present time there are orders for electrical machinery from abroad in the factory at East Pittsburgh amounting to many thousands of dollars. The London office of the company recently obtained a number of important contracts for electric railway apparatus, among which may be mentioned: 92 motors for the Hull Tramway Company, 48 motors for the Bradford Tramway Company, 80 motors for the Norwich Tramway Company and other smaller orders, bringing the total up to 262 electric railway motors and eight generators now under construction for England, which is good evidence of the fact that American manufacture is constantly gaining favor in Europe.

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ACTIVE SOLICITORS WANTED EVERYWHERE for "The Story of the Philippines" by Murat Halstead, commissioned by the Government as Official Historian to the War Department. The book was written in army camps at San Francisco, on the Pacific with General Merritt, in the hospitals at Honolulu, in Hong Kong, in the American trenches at Manila, in the insurgent camps with Aguinaldo, on the deck of the Olympia with Dewey, and in the roar of battle at the fall of Manila. Bonanza for agents. Brimful of original pictures taken by government photographers on the spot. Large book. Low prices. Big profits. Freight paid. Credit given. Drop all trashy, unofficial war books. Outfit free. Address F. T. Barber, Sec'y. Star Insurance Bldg., Chicago.

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Prompt attention given to all matters before the Patent Office, and applications for patents prepared here at Washington from sketches, photos, or models, in a manner to give highest satisfaction and with less expense than you will incur elsewhere. Write and convince yourself of this fact. As an attorney at Washington is indispensable you can save the expense of having two by communicating directly with me.

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Kindred.... ...Interests

Cass & Aaron, 141 South Clinton street, Chicago, are about to enlarge their shops. This company make a feature of repairing transformers, commutators, armatures and general electrical machinery. They also market second-hand dynamos and motors.

The Thanksgiving Souvenir sent to its friends and customers by the American Electrical Works, Providence, R. I., is as usual a distinctly novel creation. The designs and sentiments are appropriate to the season, and the "point" is carried in a little wooden case which contains a needle already threaded for sewing up the turkey.

The Columbia Incandescent Lamp Company, on Olive street, St. Louis, has recently been greatly enlarged and improved. A representative of the ELECTRICAL REVIEW, who recently visited the "Columbia" establishment, found the factory in a most active condition, and as one of the officers of the company remarked, "taxed to our limits to meet the phenomenal demand of the season for 'Columbia' lamps."

Miniature Lamps for Decorative Purposes—The Central Electric Company, Chicago, announces that they are making great preparations for the usual holiday trade in miniature lamps for decorative purposes. They are carrying large stocks of these lamps in clear and natural colors, in all candle-powers and voltages. They are also introducing a new type of standard base miniature lamp operative upon circuits of 90 to 130 volts. Its small dimensions render it particularly adapted to sign-work or most all kind of decorative purposes.

The season for Christmas decorations is always a busy one for the contractor and electric light station manager, as nearly all Christmas decoration now means some kind of special electrical illumination. The Packard sign lamp is designed with a view of meeting the demand for a lamp of uniform candle-power, voltage and efficiency for this class of work, and it is now very extensively used for decorative purposes. The Packard sign lamp is a miniature lamp of two candle-power, to be used in connection with a regular Edison candelabra receptacle and of a proper voltage to burn four in series on from 50 to 60 volts and eight in series on from 100 to 120 volts. It is guaranteed of long life and high efficiency. The fact that it is made by the manufacturers of the celebrated Packard lamp, however, should be sufficient guarantee of its high quality. The Electric Appliance Company carry these lamps and receptacles in stock at all times, but carry a specially large stock at this season of the year to meet the unusual demand.

An effort is being made by some of the art lovers of this city to secure the free exhibition here of the beautiful originals of the drawings appearing in "Field Flowers," the book issued by the committee to provide a fund which is to be divided equally between the family of the late Eugene Field and the fund for the building of a monument to the memory of the beloved poet of childhood. The following artists of world wide reputation each contributed one or more beautiful drawings, illustrating some of Field's most representative works, as their labor of love in this noble undertaking: F. Hopkinson Smith, Reginald B. Birch, Stanford White, Irving R. Wiles, Frederic Remington, R. M. Hynes, W. L. Taylor, A. B. Wenzell, Charles Howard Johnson, Alice Barber Stephens, W. Granville Smith, Frank O. Small, Henry Sandham, C. J. Taylor, Orson Lowell, Eric Pape, Mary Hallock Foote, A. B. Frost, W. A. Rogers, Charles C. Curran, Abby E. Underwood, George Wharton Edwards, Harry Fenn, W. H. Drake, Charles Mente, Charles Graham, E. W. Kemble, Carl Werntz, Wm. Schmedtgen, J. T. McCutcheon, R. W. Taylor, L. S. Ipsen; music by Miss Mildred J. Hill; posters by Will H. Bradley, Edward Penfield, Miss Ethel Reed. This collection of originals would have cost fully $15,000 had they not been thus contributed, and they are being exhibited in the different large cities, where they are attracting universal attention. "Field Flowers" is a cloth-bound book, eight by eleven, gilt edges, heavy enameled cardboard, die-stamped in gold and color from design by Stanford White, selected by St. Gaudens. These souvenir books are now ready for distribution. Subscriptions as low as a dollar will be received, but you are not limited to any amount. For each dollar subscribed to this fund there will be issued a copy of "Field Flowers" as a souvenir certificate of subscription. The book may also be had at book stores, price $1, or it may be obtained direct of the committee (by enclosing 10 cents additional for postage) by addressing The Eugene Field Monument Souvenir Fund, 180 Monroe street, Chicago.

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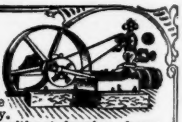
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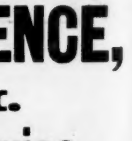
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